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JULY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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EDITORIALS

Cooperation Between Physician and Dentist
The Last Shall Be First

COUNCIL ON DENTAL THERAPEUTICS

Mouth Washes

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CONTENTS

Board of Trustees of the American Dental Association, 1931-1932.....Frontispiece

ORIGINAL COMMUNICATIONS

Radical Departures from Theories and Methods Pertaining to Children's Dentistry.
By R. C. Willett, D.M.D.....1085

Progress in England in Elucidation of the Mode of Development of Normal and Abnormal Jaws, and of the Etiology of Irregularity and Malocclusion of the Teeth.
By J. Sim Wallace, M.D., D.Sc., L.D.S., F.A.C.D.....1102

The Lock-Pin Porcelain Inlay.
By D. Hoyt Simpson, D.D.S.....1116

The Movement for Reform in Dental Drugs.
By Samuel M. Gordon, Ph.D.....1123

The Pediatrician's Views on Disorders of the Teeth.
By Isaac A. Abt, M.D.....1133

Mechanotherapy in Periodontoclasia.
By Vern D. Irwin, D.D.S.....1140

Methods and Results in Condensation of Dental Porcelain.
By J. Raymond Gill, D.D.S.....1147

Malrelation of the Edentulous Maxilla and Mandible.
By Alden J. Bush, D.D.S., F.A.C.D.....1154

Correlation of Concept and Treatment in Orthodontia.
By Andrew Francis Jackson, D.D.S.....1161

The Problem of the Unethical Dentist.
By Bertrand T. Connell.....1176

Cellulitis of the Face.
By George W. Christiansen, D.D.S.....1180

Operative Restoration of the Teeth in Relation to Adjacent Tissues.
By Ralph R. Byrnes, D.D.S., F.A.C.D.....1189

Promoting Normal Development by Maintaining the Function of the Deciduous Teeth.
By O. W. Brandhorst, D.D.S.....1196

The Problem of Hypodermic Needles Broken in the Region of the Mandible and Maxilla: Report of a Case.
By Theodor Blum, D.D.S., M.D., F.A.C.D., F.A.C.S.....1204

Acid Burn: Report of a Case.
By T. E. Braly, D.D.S.....1212

The Future Practice of Operative Dentistry.
By Arthur D. Black, A.M., M.D., D.D.S., Sc.D.....1213

Mobilization of the Ankylosed Jaw.
By Willis C. Campbell, M.D.....1222

Bilateral Occurrence of Impaction of Mandibular Fourth Molars: Report of Case.
By Ralph W. Edwards, D.D.S.....1230

EDITORIAL DEPARTMENT

Cooperation Between the Physician and the Dentist.—And the Last Shall Be First.—Send Us the Original.—Charles Edward Meerhoff, D.D.S. (1868-1932).....1231-1237

COUNCIL ON DENTAL THERAPEUTICS

Accepted Dental Remedies.....1238

Mouth Washes.....1239

Manufacturer of Pyro-Rem Fined.....1244

BUREAU OF PUBLIC RELATIONS

The Cincinnati Mouth Hygiene Campaign.....1245

Scientific Exhibits for the Rank and File.
By George H. Wandel, D.D.S.....1253

CURRENT LITERATURE

Extracts and Abstracts.....1258

MISCELLANY

Book Reviews.....1262

Social Insurance: Deterioration of Medical Services Under Compulsory Health Insurance.....1263

The Social Significance of Professional Ethics.....1264

News.....1265

Announcements.....1266

ADVERTISEMENTS

Index to Advertisements.....A-33

Classified Section.....A-26

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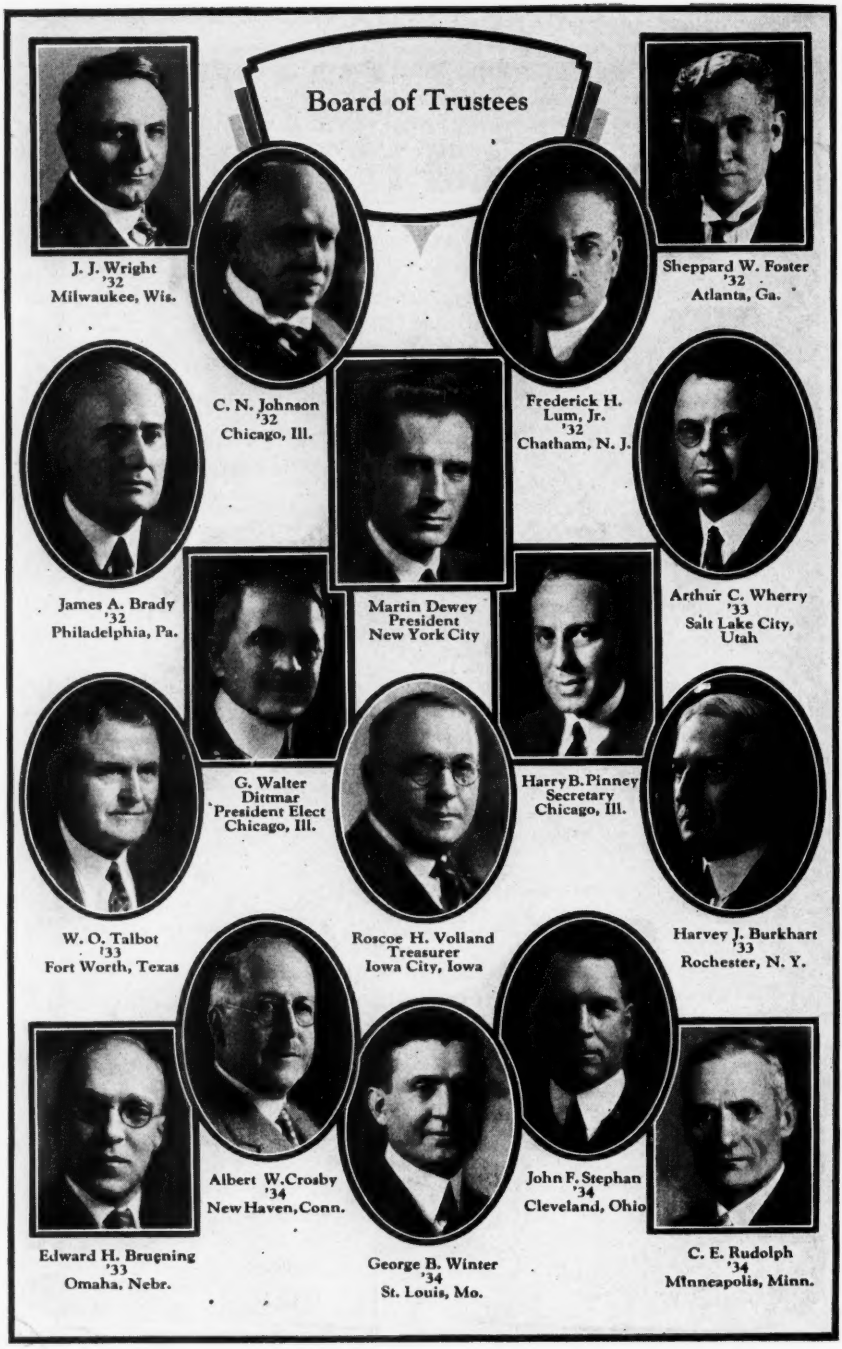

BOARD OF TRUSTEES OF THE AMERICAN DENTAL ASSOCIATION, 1931-1932

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THE JOURNAL
of the AMERICAN DENTAL ASSOCIATION

Vol. 19 JULY, 1932 No. 7

Original Communications

RADICAL DEPARTURES FROM THEORIES AND METHODS PERTAINING TO CHILDREN'S DENTISTRY*

By R. C. WILLETT, D.M.D., Peoria, Ill.

THE awakening of the dental profession to the conditions contributing to malocclusion of the permanent teeth through neglect in the maintenance of function of the deciduous teeth has been slow; but, during the last ten years, an occasional light mental sleeper has been aroused to dangers involved in the neglect of children's dentistry. At present, the alarm is spreading, but there is need of more messengers —messengers equipped with more than a set of vocal chords, the paramount need of the hour being dentists possessed of an operative skill and a working knowledge of prosthesis directly applicable to the treatment of oral lesions common to the child dentition, and a willingness to apply it.

Through personal letters received from practically every state in the Union, from Canada and from European countries, it is evident that dentists the world over are at last devoting serious thought to the subject of the deciduous teeth.

These letters asking for information concerning the preservation of deciduous teeth and the interception of malocclusion, have been welcomed as an encouraging reaction to a few articles that have appeared in current dental literature during the last five years. The many communications are gratifying to an orthodontist because they are prime evidence that there are thinking men in the general practice of dentistry who are thoroughly alive to the fact that the problem of childhood dentistry has not been fully met and that there is a desire on the part of many for a knowledge of new methods that will more effectively restore and maintain normal function of the deciduous teeth until the time of their exchange for permanent ones.

*Read before the Chicago Dental Society, Nov. 17, 1931.

*This paper, with additions, was given before the Greater New York Meeting for Better Dentistry, Nov. 30, 1931, and the Golden Jubilee Anniversary Meeting of the St. Louis Dental Society, Dec. 7, 1931.

Before attempting to present a radical change in theories that had been handed down from year to year, and, through the teaching staffs of our dental schools, embodied in standardized methods, it seemed a matter of wisdom and logic to observe and check carefully the existing faults in those methods. Research of this kind, on the part of an orthodontist might seem to many a departure from the confines of his specialty, but careful consideration will reveal the fact that children's dentistry is so closely related to orthodontia that the weakness of one will readily afford the etiologic conditions which will eventually complicate action

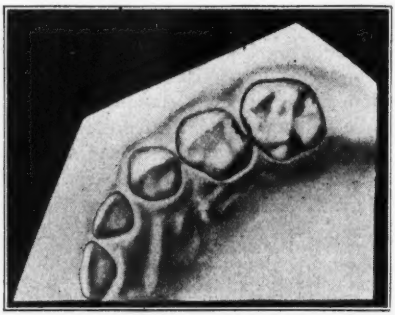

Fig. 1.—Approximal caries frequently found in first and second deciduous molars.

in the other. For this reason, the orthodontist's interest in the theories and practice of children's dentistry must actually take precedence over his interest in his own remedial work for the child. Further than that, the family dentist, those in the exclusive practice of children's dentistry and the orthodontist have many problems in common that demand mutual research and study, with final effective collaboration in action to the end that ineffective methods in the dental phase of health service to the child shall less frequently arise.

With this line of reasoning in mind, and, at first, independently of fellow support, an opening was sought through which to attack the problem, justified upon four convictions:

1. That it was the problem most closely allied to orthodontia in the prevention and interception of malocclusion of the permanent teeth.

2. That, in the solution of this problem, the fundamental principles of the economic preservation of the human teeth could be demonstrated.

3. That the methods common to the practice of dentistry were, when applied to the deciduous teeth, rarely effective in the restoration of their full function.

4. That this most important branch of dentistry (children's dentistry) was not, generally speaking, receiving the serious attention that it deserved from the authors of standard works on special dental pathology, the general practitioner of dentistry or his clientele.

To sustain the fourth conviction that children's dentistry was not, generally speaking, receiving the serious attention that it deserves from authors of standard works on special dental pathology and other writers on the subject relating to prophylactic and remedial treatment of children's teeth, an analytic study of dental literature dating back about fifteen years was made. Some of the dental opinions concerning the deciduous teeth will be reviewed to show the inconsistency of much that has been handed down from one decade to another with less radical advance than can be found in any other branch of dental science.

In 1916, the program committee of the Illinois State Dental Society called on a man of known interest in children's dentistry to write a paper on the treatment of children's teeth. From the

standpoint of sentiment, and in view of the fact that child dentistry was at that time sadly neglected and infrequently discussed, the paper was equal in many respects to some present-day articles on the subject, while the operative technic advocated was little more than a step behind.

Of especial interest to orthodontists is the point stressed by the writer in these words:

> There often arises in the treatment of children's teeth a seeming deficiency in development of the jaw. This is most often caused by the crowns of the teeth becoming broken down and the roots of the teeth closing together, finally forming a smaller arch. This trouble can sometimes be practically overcome by packing the proximal cavities that occur with pink base plate gutta-percha. The constant chewing on this pack spreads the teeth apart, stimulates and increases growth of the alveolar process, giving sufficient room for the permanent teeth.

The writer adds, "While on this matter of development of the jaws, I must not fail to say that the average child does not exercise his teeth sufficiently."

This quotation and others that follow are not used in a spirit of ridicule, but to show that some serious thought was beginning to take form in regard to the relation of function to structure and growth, though the writer had little conception of an efficient technic of application that would actually restore hygienic conditions and afford a comfortable means of chewing.

When published, this article had a nation-wide circulation, and there is no question that, through its influence, an impression was made on the practice of children's dentistry. The same unsound doctrine is found in the current dental literature.

Between that time and the year 1922, much doctrine of a similar nature found its way into print, but in it there was nothing of a really constructive nature. In the face of this dearth of informative literature on the subject, interest in children's dentistry was steadily growing, and the promotion of preventive measures in practice becoming a popular subject.

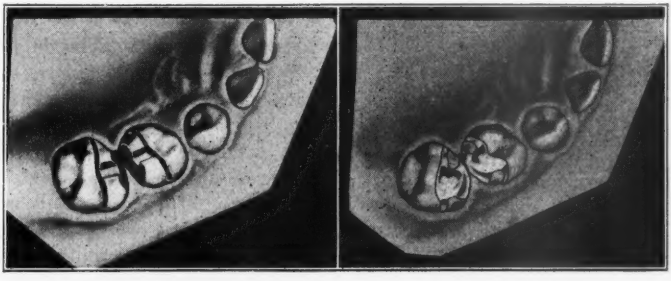

Fig. 2.—Left: Slice cavity preparation for indirect method of making hard gold alloy inlays for first and second deciduous molars. Right: Hard gold alloy inlays seated in prepared cavities.

In 1922, a writer internationally known said in an exhaustive article on preventive dentistry:

> In our enthusiasm over mouth hygiene, oral prophylaxis, and diet, many seem to have largely overlooked the preventive phases of operative dentistry. When the other measures, hygiene, prophylaxis, and diet, applied as best they may be, have failed in a given case—and we must admit that failure, to a greater or less extent, is the result in the mouths of a majority of children—then our principal

reliance must be upon the best operative procedures for the saving of the teeth. These are generally known, but not well practiced.

Possibly 90 per cent of them may be accomplished by the use of nothing other than black copper cement. The important thing is to see children often, and to be thorough in what we do.

This writer, an author of standard dental works, whose opinion is widely accepted the world over, when he suggests that 90 per cent of the filling of deciduous teeth may be done by the use of black copper cement evinces no appreciation of the necessity for maintaining function of the deciduous teeth and of oral health beyond the mere stopping of cavities. It may be true that black copper cement when properly manipulated

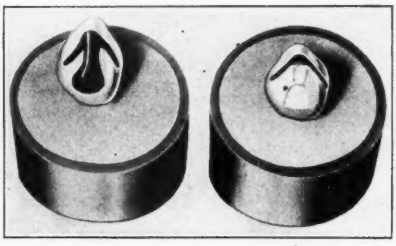

Fig. 3.—Left: Cavity preparation involving approximal surface of deciduous cuspid. Right: Inlay seated in prepared cavity.

will arrest the progress of caries, but it is no more dependable than any other plastic material, and its use will in no case restore and maintain function. This article had an international distribution and was the means of again spreading an unsound doctrine that, even at the present time, is approved by many dentists.

From 1922 to the present time, there was a noticeable increase in the volume of literature pertaining to children's dentistry, and writers on the subject have become numerous. In their articles, they have said much about child psychology, means of securing and sustaining the child's interest and the education of parents to the importance of the issue as a health measure. In recently published treatises and in addresses, more frequent reference is made to function of the deciduous teeth, and the belief is expressed that the filling of these teeth should be done in a way that will restore and maintain function. In no instance was a definite technic applicable to the making of such restorations suggested or devised, a technic that would meet the needs of the problem and sustain the ideals set forth in discussions of the subject.

The operators unanimously agree that amalgam, of copper or silver, is the ideal filling for deciduous molars, and they made no exception as to the surfaces of the tooth involved. They do not seem to realize, or else they ignore, the character and distribution of the enamel and dentin of deciduous molars and the fact that depth of cavity preparation and undercuts necessary for the retention of such plastic materials not only endanger the pulp but also leave frail walls that as a rule will check, permitting leaks that invite recurrence of decay.

It is difficult to establish contact points in the making of proximal amalgam fillings, and faulty operation in this respect, combined with the presence of gingival margins that are usually left unfinished, opens the way for the retention of food packs, the presence of nests for microorganisms and irritation of gingival tissues; yet these writers assure us that these fillings are placed "to preserve a comfortable masticating surface." Some of them even suggest the bridging with amalgam from one proximal cavity to the opposing proximal cavity.

While it is my intention to speak in this paper only in general terms and to avoid individual attack, I feel compelled

to refer directly to the work of M. Evangeline Jordon, "Operative Dentistry for Children." In it the writer states her opinion that the gold inlay "is of doubtful value," and further asserts that "the inlay spreads under the stress of mastication." It seems incredible that this writer does not know that there are hard gold alloys that will not spread under any "stress of mastication." From an orthodontic point of view, there appears little in the operative technic advocated by Dr. Jordon that could be expected to reestablish and maintain function of the deciduous teeth, once they have become defective because of caries.

any length of time that is abscessed and has a fistulous opening."

The paper advocated the retention of the second deciduous molar even when it has a fistula, until the first permanent molar erupts. The lamentable feature of the presentation of these suggestions relating to the retention or extraction of deciduous teeth involving so much disease was that, in the discussion that followed, no particular objections were raised, nor was any challenge given to the doctrines set forth.

Statements in regard to the importance of maintaining full and unimpaired function of the deciduous teeth will now be

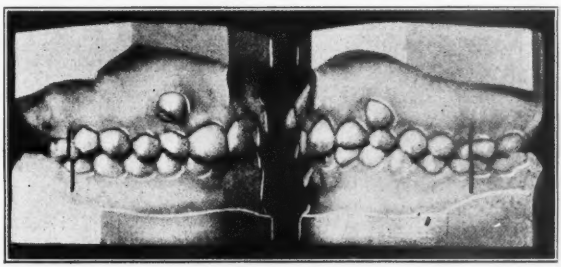

Fig. 4.—Malocclusion resulting from prolonged retention of deciduous cuspids.

In the work of Hogeboom, "Practical Pedodontia," there is to be found nothing more acceptable in doctrine or practice, from an orthodontic standpoint, than in that of Jordon. It is an even break between them as to mistaken estimation of effective remedial or preventive methods.

In 1929, an essay was read before a middle west dental society in which was presented what the writer termed, "practical suggestions in children's dentistry." I shall quote only two of them, as they are typical of the others. Rather amazing was this statement: "With the exception of a few very young children, it is not advisable to try to save a tooth for

quoted from standard works on dental pathology, histology and embryology, probably most universally used by students as textbooks in our schools of dentistry.

In his textbook "Fundamentals of Dental Histology and Embryology," published in 1926, on page 129, Bödecker says:

> A child with carious deciduous teeth does not masticate properly, therefore the oral tissues do not receive the necessary massage, the blood supply becomes sluggish, growth progresses only slowly and the jaws do not develop to their full size, *frequently resulting in malocclusion of the permanent set.*

As forcefully as the sentence reads rel-

ative to the effect of the presence of carious deciduous teeth on the development of the jaws, the word "frequently" suggests a possibility that malocclusion does not always occur as a result of the pathologic defects described, while in reality malocclusion is the inevitable result of such defects.

In a work on "Special Dental Pathology" by G. V. Black, third edition, with revision by Arthur D. Black, on page 331 appears the following statement under the paragraph heading, "Serious Results of Exposure of Pulps of Deciduous Teeth."

> It often happens that exposure of the pulp of a deciduous tooth will mean the premature loss of the tooth. This *may lead to* serious consequences by causing irregularities in the eruption of the permanent teeth.

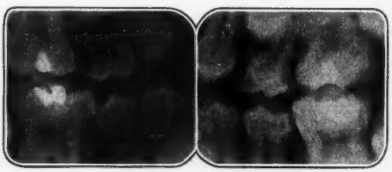

Fig. 5.—Malocclusion of bicuspids resulting from prolonged retention of maxillary second deciduous molars.

The weakness of the author's statement is the qualifying word "may" which should read "will."

If human life has a value distinct from and superior to all things of created value, it is the plain duty of our profession to seek the elimination of indefinite statements that are substantiated in neither clinical observation nor scientific analysis, but it would not be justifiable to criticize the doctrines and practices pertaining to children's dentistry that have been referred to, if no more had been done than to review literature on the subject.

A random survey of 1,000 cases has been made from the records of my own practice, which is made up from the children of high and middle class cultured people and is, I believe, representative of the majority of orthodontic practices. This survey, which was made without discrimination or selection, the ages of the patients ranging from 17 months to 10 years, was undertaken with one object in view; to determine definitely the relative number of cases in which caries of the deciduous teeth, defective fillings in deciduous teeth, premature loss of deciduous teeth and evident neglect of preschool dental attention actually contributed to the complications of malocclusion. The findings of the survey were

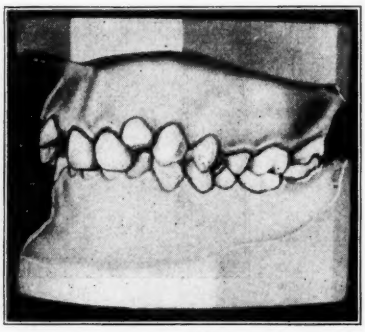

Fig. 6.—Type of malocclusion caused by premature loss of deciduous molar.

as shown in the accompanying tabulation.

	Per Cent
Caries of deciduous teeth and defective fillings	60.3
Premature loss of deciduous teeth.... (Total number of deciduous teeth prematurely lost, 893)	28.9
Caries, defective fillings and premature loss of deciduous teeth the direct cause of malocclusion.....	8.4
Caries, defective fillings and premature loss of deciduous teeth the contributing cause of malocclusion.	52.5
Evident need of preschool dental attention	61.2

It will be definitely understood that, in this survey, only caries, defective fill-

ings and the premature loss of deciduous teeth were considered. No note was made of defective or extracted permanent teeth.

In concluding the survey, I was more impressed than ever before with the importance of making record casts. These casts are, of course, to be filed and properly indexed for future reference, this being done for a number of reasons:

1. That the changes occurring in the dentition of every child patient's mouth can be traced.

2. That if the case is one about which there is any doubt, the dentist can satisfy both the parents and himself as to whether normal progression of growth and occlusion is taking place. There should be no guessing about such a matter of vital importance.

3. That, if the advice of the dentist is not followed and the patient returns a few years later with a pronounced malocclusion, the former is not found without evidence of the soundness of his judgment when he was first consulted.

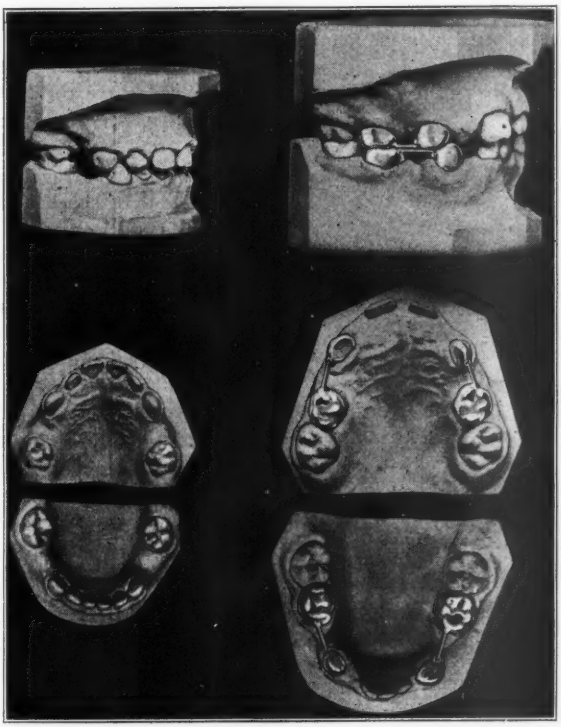

Fig. 7.—Prevention of malocclusion in case of child for whom it became necessary to remove maxillary and mandibular first deciduous molars at age of 2 years and 7 months (cast above, left). The cast above, right, was made at the age of 6 years and 9 months.

Up to this time, I am well aware that only unstinted criticism of professional neglect has been made and the consequences of such neglect have been discussed, and this without a single suggestion regarding a technic with which to replace the ineffective methods, a technic that any dentist who accepts a child as his patient should be able to apply in his personal efforts to remove the blot that without question rests upon the name of dentistry.

It was more than fifteen years ago

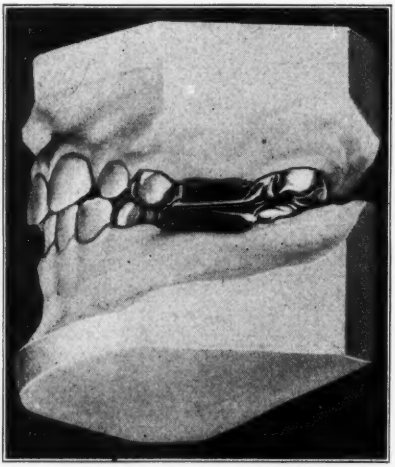

Fig. 8.—Fixed functional space maintainers in case in which first and second deciduous molars have been prematurely lost and deciduous cuspid and first permanent molar serve as anchorage.

that I began to realize a truth embodied in a comparatively recent lecture by Charles R. Baker: "The greater field of constructive work within the general practice of dentistry remains practically untouched, and more important than the practice of orthodontia is the prevention and interception of malocclusion."

Under the pressure of this ever-growing conviction, I could no longer refrain from delving into particular phases of an important work, the seeming neglect of which had complicated 60 per cent of the cases of malocclusion that I attempted to treat. So, with due regard for every other phase of prophylactic and remedial service that entered the child dental health problem, the one chosen to work in was what might be termed the "Main Street" problem, the one most commonly met in everyday practice as far as the child was concerned: the maintenance of function of the deciduous teeth.

For operative experiment and clinical study, the most hopeless and undesirable types of children were chosen through orphanages and child welfare associations. This was done because we believed that if the contemplated operations could be successfully carried out on physically and mentally handicapped child patients, there would remain no justifiable excuse in private practice for the neglect of the normal child.

There was another object of equal or even greater interest in the contemplated work which was to demonstrate beyond further question whether function of the deciduous teeth, once partially or wholly lost, could be restored to the extent that a renewed acceleration of growth of the dental arches would actually take place.

The early results of this clinical work were not always encouraging, but through the process of trial and error, and a radical departure from methods common in the usual practice of children's dentistry, we soon arrived at one definite conclusion: there was no justifiable excuse for failing to give the child patient complete dental service, to the end that function of the deciduous teeth be maintained until the time of their exchange for permanent ones. In the

course of a few years, further experiments had justified another conclusion: that in cases presenting a recent premature multiple loss of deciduous teeth, artificial devices similar to those placed in the mouths of adult patients could be applied and that when these were properly placed to restore function, an accelerated growth of the dental arches occurred. Most important, because of its bearing on general dental responsibility, was the conviction through observation of the mental attainment of the little patients that the statement of the New York Dental Division of the Metropolitan Life Insurance Company, "Any child with an oral defect is a cripple" is as true as a geometry proposition.

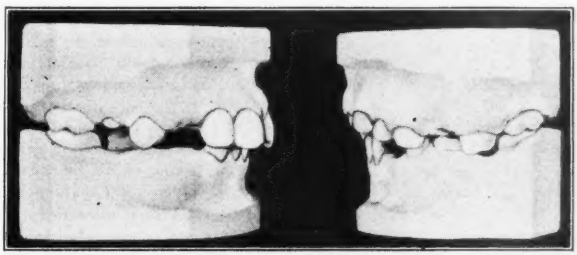

Fig. 9.—Mixed dentition. Left: Cast showing first bicuspid dropped out of occlusal alinement because of lost function. Right: Cast showing second deciduous molar dropped out of occlusal alinement for the same reason.

In demonstrations before many dentists and orthodontists of the beneficial results from the different types of fixed and removable functional space maintenance devices that are here shown, the question is frequently asked, "Upon whom rests the responsibility for their application in practice?" No similar question has been asked in regard to the making of efficient restorations for deciduous teeth as this work is plainly the duty of the family dentist and of those specializing in the practice of children's dentistry; but regarding the former there exists a wide difference of opinion; and until a definite answer is given and accepted, there will remain a broad gap in oral health service. Untold thousands of children will either fall into the hands of the orthodontist for a meager service compared to that which might have been given through interception, or will go through life dental cripples.

The fact of the child's helplessness in the matter should make a strong appeal to those in a position to render the necessary service in time to conserve his health and his appearance, two things on which so much of his ability to take care of himself in life will depend. He is sorely in need of a dental "Big Brother." Where shall he find him?

DISCUSSION

C. N. Johnson, Chicago, Ill.: I want to call your attention to Dr. Willett's last statement, when he appealed to the "big brother," and to his last question as to whether we shall ever find him. I hope that we will. His need has been demonstrated tonight by Dr. Willett, and I think that the big brother will come from the ranks of the general practitioners, not from the orthodontists. What we need most is the recognition on the part of the general practitioner of the needs of early attention for many of these children. The demonstration we have listened to tonight, together with the demonstrations given in the past by Dr. Willett, must impress the dental profession with the need for early

care and for prevention. Usually we think of prevention as the filling of cavities in teeth, but it is something more than that, particularly in children. It is the prevention of malocclusion, the prevention of deformities, the prevention of limitation of function, and I know of no clearer demonstration than that which has been given by Dr. Willett to show the necessity for the early recognition of the causes of these disorders. Look at that last case shown; the transformation made in that child who was so handicapped appeals to everybody. This is one of the best examples that I have ever seen of restoring function which has been lost, and I honor Dr. Willett for the work he has done in this type of case. I wish it were possible to go into some technical details of this branch of our service. I do not wish to sidetrack the

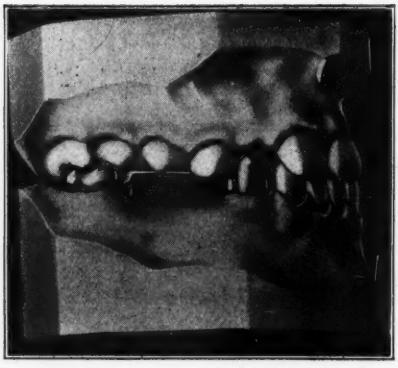

Fig. 10.—Example of controlling normal progression of growth and occlusion of teeth in case of mixed dentition. A functional space maintainer prevents the first bicuspid of the maxillary arch from dropping out of alinement.

general discussion of this subject, but I question the nomenclature used, not only by Dr. Willett, but also by other men in the profession. I wish to protest against one thing in particular. Premolar is definitely a misnomer; the prefix "pre" means advance in position or in time. There is no advance in time in the case of this tooth, and the term is a misnomer as far as position is concerned. If we call the tooth a premolar because it is in advance of a molar, we might call a cuspid a premolar—anything in front of a molar would be a premolar. The bicuspid does not come in in advance of a molar; it comes in after the molar. In 1893, there was much discussion on the whole question of dental nomenclature, and at that time G. V. Black classified human dental anatomy as it was never done before and has never been done since. If you would like to have an insight into logical nomenclature, read the report written by Dr. Black and presented at the Dental Congress. I apologize for bringing up this question, because I do not want to interfere with the trend of thought of Dr. Willett's paper, but it comes up time after time in the literature. It becomes more and more confusing. I wish we could have a discussion some time on dental nomenclature, just as we did at the time of Dr. Black's paper in 1893. This address and those given in times past by Dr. Willett are of particular importance to the general practitioner of dentistry. He sees these children before the orthodontist sees them. I sometimes think we should try to educate the medical men, who see them even before the general practitioner, and I think these problems of malocclusion should be impressed on them. These children are not getting a fair chance, and it is your fault and my fault that they are not. Dr. Willett has demonstrated without any question the value of his theory. He has done it on the screen, in papers and with patients. He has sacrificed himself as far as time and finances are concerned, has had the courage of his convictions, and has carried on these cases with the poor children in Peoria. The results of his labors we have seen in part tonight.

F. Blaine Rhobotham, Chicago, Ill.: The introductory part of Dr. Willett's paper recognizes the necessity for a better understanding of the problems common to the orthodontist, the general practitioner and those limiting their practice to dentistry for children. The point is well taken and should receive more careful attention from the profession. The paper further comments on the fact that children's dentistry has been wofully neglected. In sustaining this contention, Dr. Willett reviews the literature of the past fifteen years, pointing out weaknesses. It is evident that he does not intend to attack individuals, but rather the laxity of our profession. To indicate his position clearly, it was, of course, necessary to point out definite citations in dental literature. Dentistry began as a reparative art, and progressed little be-

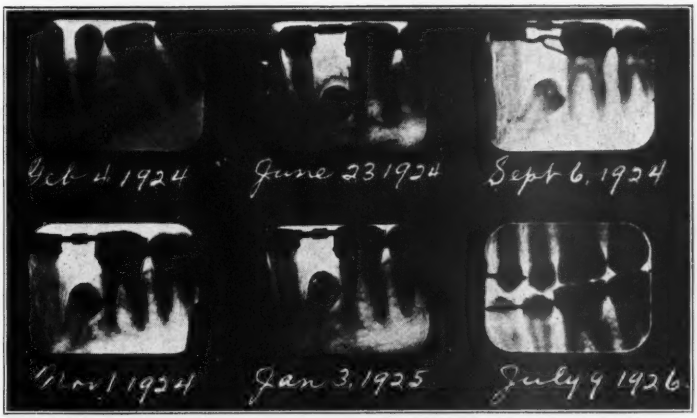

Fig. 11.—Impaction of second bicuspid, invariably resulting from premature loss of second deciduous molar prior to eruption of first permanent molar. The patient was 18 years and 4 months old at the beginning of treatment.

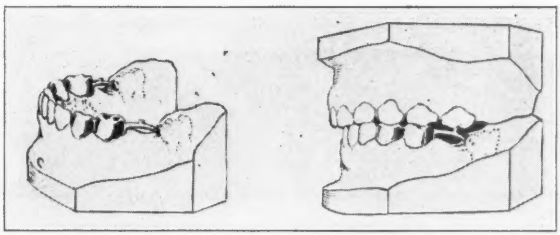

Fig. 12.—Type of one-piece cast functional space maintainer that will prevent impaction of second bicuspid if properly made and placed at right time. It preserves space for the second bicuspid, restores function in the affected area, maintaining the position of the upper second deciduous molar, and guides the first permanent molar to position.

Fig. 13.—Eruption of first permanent molar controlled by use of one-piece functional space maintainer, which also prevents impaction of bicuspid. Left: April 1, 1927; right: June 27, 1928.

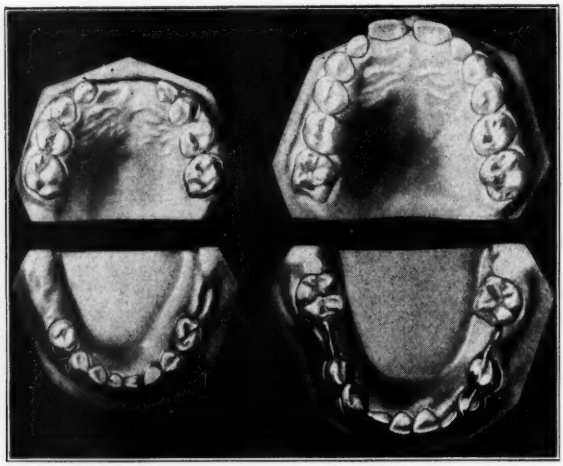

Fig. 14.—Case showing possibility of preventing serious malocclusion of permanent teeth when second deciduous molars are lost before eruption of first permanent molars. Left: Age 5 years and 4 months; right: 8 years.

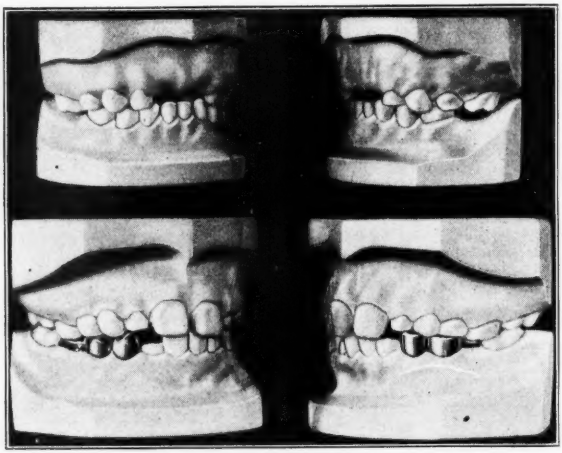

Fig. 15.—Case shown in Figure 14. Above: Age 5 years and 4 months; below: 8 years.

yond just that until late in the last century. The influence of some of the greatest men in dentistry also began to be felt about the same time. Then followed better training in our dental schools by further studies in the medical sciences. It has been only during the past fifteen years that dental training courses were lengthened sufficiently to permit proper training. This has required many additions and changes calling for time for adjustment, and it is only within very recent times that the dental colleges generally have accomplished these alterations. This explanation is offered in defense of the profession which stands so

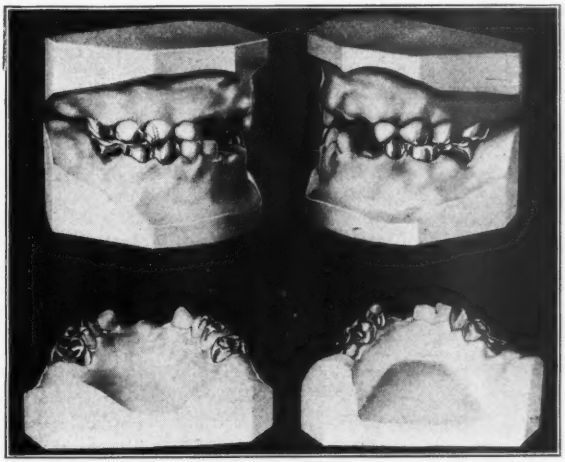

Fig. 16.—Case showing possibility of preventing serious malocclusion of permanent teeth when second deciduous molars are lost before eruption of first permanent molars.

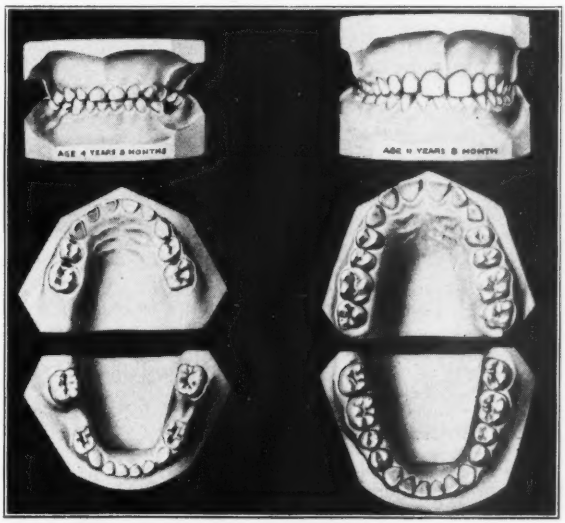

Fig. 17.—Case showing possibility of preventing serious malocclusion of permanent teeth when second deciduous molars are lost before eruption of first permanent molars. Above, left: Age 4 years and 8 months. Right: 11 years and 8 months. Below, left: Casts made after removal of space maintainers that guided first permanent molars in erupting.

accused. As prevention and interception have naturally occurred late for consideration by the professions, ours at least may be partially forgiven. In my humble opinion, the dental profession is to be congratulated for the amazing progress which has been made. There is no intention to minimize the need for an awakening. We have made many mistakes, we have been negligent, and there are new requirements to meet. They will be met largely through better training in our dental schools. Dr. Willett points out some very definite means of standardizing our technic. His theories have been carefully worked out and speak for themselves as to practicability. No two operators, no matter

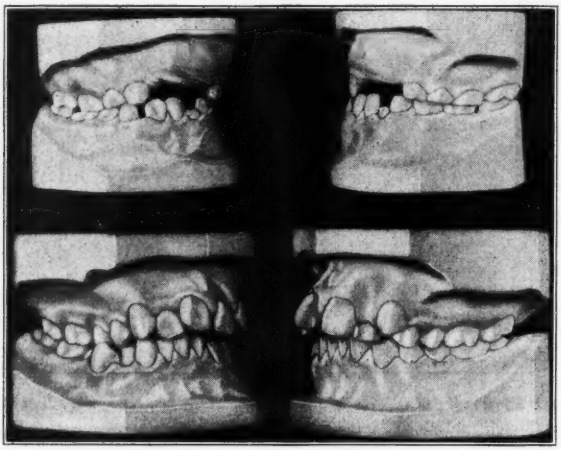

Fig 18.—Plaster casts of case shown in Figure 17; above, at 8 years; below, at 14 years; demonstrating the value of such records.

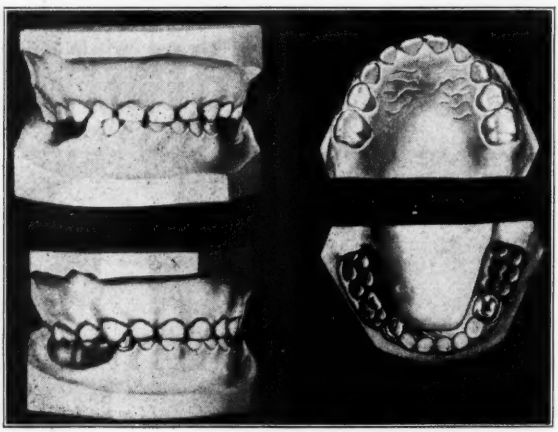

Fig. 19.—Multiple loss of mandibular deciduous molars necessitating use of devices that are removable and that are to be worn as are partial dentures for adult. Left, above, premature loss of mandibular molars; below, removable partial denture to restore function.

how proficient they may be, will agree entirely as to technic. Exception might be taken to Dr. Willett's contention that no plastic filling material is ever suitable in deciduous teeth. It can be proved beyond doubt that in selected cases several plastic materials can restore deciduous teeth to normal function. I do not think it was Dr. Willett's intention to leave the impression that his method was the only one that could bring success. Rather, it appears that he wishes to offer an acceptable technic.

T. L. Grisamore, Chicago, Ill.: This paper presented by Dr. Willett, if read and studied and its teachings put in practice by the dental profession, would be of inestimable value in developing individuals with more nearly normal occlusion of the teeth. There would be healthier tissues in the oral cavity and more pleasing facial outlines. The oral hygiene movement has gradually increased during the past twenty years. It has done much toward educating parents and reminding the dental profession of the importance of caring for the mouths of young persons during the developmental period. We have learned that any condition which interferes with normal functional forces, utilized in the natural growth and development of the oral cavity and associated parts, is bound to result in abnormal development. We can never hope to have a child develop into an adult with perfect occlusion of the teeth or the facial outline Nature intended, if the forces utilized in building these parts are interfered with. In routine practice, the average conscientious dental practitioner renders to humanity one of the greatest of his professional services when, in caring for young children, he prevents the development of malocclusion and deformity of the face, and at the same time aids Nature in building a normal healthy body. This phase of dental practice may well be divided into two divisions: prevention and correction. The premature loss of deciduous teeth is probably responsible for more cases of malocclusion than any other one cause.

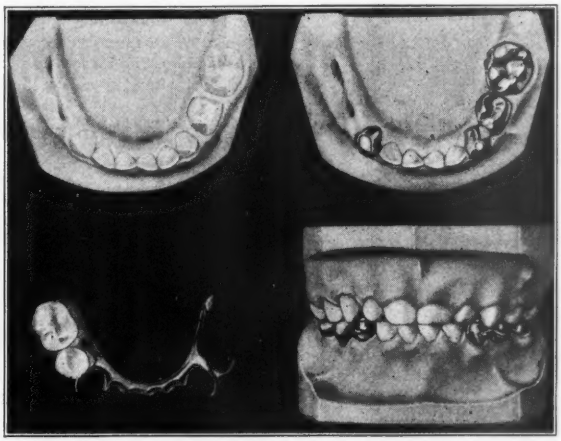

Fig. 20.—Casts (made at 5 years and 6 months) demonstrating that even premature loss of first and second deciduous molars on one side, prior to eruption of first permanent molar, can be successfully managed if taken in time.

All deciduous teeth should be retained in the mouth until the permanent teeth are far enough through the tissue to prevent the space from closing. There is little trouble caused by premature loss of deciduous incisors owing to the fact that the permanent incisors develop at an early age. These teeth, being much wider than the deciduous teeth, cause the developmental spaces to form between the deciduous incisors; after which there is little occasion for worry if these deciduous teeth are lost. Because of the early eruption of the first bicuspid, the premature loss of the first

deciduous molar seldom causes any serious disturbance from space closing. The greatest trouble comes from the loss of the second deciduous molar. This tooth should normally be lost at about 12 years of age, which is after the eruption of the first permanent molars and first bicuspids. If these teeth are lost, or if the mesiodistal diameter is decreased by

Fig. 21.—Child who lost the ten deciduous teeth from maxillary arch and the four deciduous molars from mandibular arch at age of 3 years and 3 months.

caries to any appreciable extent, the eruptive force of the oncoming second molars, and the muscular action of the lips on the teeth anterior to the space, will close the space and cause an impaction or malalinement of the second bicuspid. If one of these teeth is lost on each side of the mouth, there will often be a closing of the bite. This is due to the fact that in many cases during the transition period from the deciduous to the permanent teeth, the occlusal force is thrown on the four second deciduous molars. This will happen in all cases if the deciduous molars are lost before the first permanent molars are fully erupted. The deciduous cuspids are also of vital importance to the proper forming of the permanent arches. Frequently, the roots of these teeth absorb and the teeth drop out long before the permanent cuspids are ready to erupt. It takes only a few months for the muscles of the lip to cause the incisors to move lingually and toward this space, closing it entirely, unless the upper teeth are held forward by an excessive overbite. These teeth should never be extracted to make room for crowded incisors, as this will only add to the

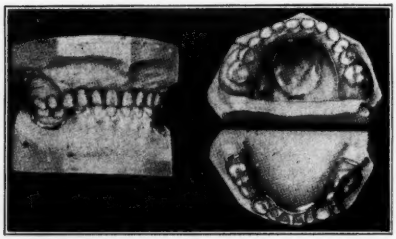

Fig. 22.—Full upper and partial lower dentures made for child shown in Figure 21, two months later.

deformity later on. At all times, the endeavor should be to keep the four second deciduous molars and the four deciduous cuspids in the mouth, and in a healthy condition; to retain the normal mesiodistal diameter until their successors are ready to erupt. These teeth are the only ones that erupt between two other permanent teeth. Dr. Willett has very accurately described the construction of appliances for the retention of space remaining from too early loss of deciduous teeth. His construction of what I would call partial dentures for these small children, 4 to 9 years of age, and the beautiful cases of occlusion and facial outline he has aided Nature in building should be an inspiration to every man who is in any way connected with the handling of the mouths of children. Not

infrequently, the deciduous teeth are found in position years after the average time that these teeth are supposed to be lost. If a child of 11 years has all deciduous molars in position, they should not be immediately extracted, but a roentgenogram should be taken. If this shows the bicuspids to be in position, their eruption apparently being retarded by the presence of the deciduous molars, the first deciduous molars should be extracted first, and the eruption of the first bicuspids should be awaited before removal of the second molars. This precaution may save great inconvenience to the patient and much embarrassment to the dentist. The percentage of cases of malocclusion coming under my observation which were caused by too long retention of deciduous teeth is very small. Occasionally,

Fig. 23.—Boy shown in Figure 21 as he appeared wearing dentures.

we find a bite being opened by the second bicuspid erupting under a second deciduous molar. We find permanent incisors erupting lingually to deciduous incisors, the roots of deciduous teeth deflecting permanent teeth out of their normal line of occlusion and cuspids labially or lingually (usually labially) to the retained deciduous cuspids. If there is sufficient space, the natural developmental forces will usually bring these teeth to their normal position after the obstruction has been removed, the most frequent exception being the upper permanent incisors. If the deciduous incisors remain in position, the permanent ones will be forced to erupt lingually to the lower permanent teeth and orthodontic interference will be necessary. Abnormal breathing, if permitted to continue through the early developmental period—say, until 15 years of age—has a decided detrimental effect not only on the dentofacial area but also on the entire physiognomy. By this age, the abnormal function of the various developmental forces, especially atmospheric and muscular pressure, has interfered with the normal development of the bones of the face to an extent that they can only be partially corrected by orthodontic procedure, and the patient is too old for Nature to perform a complete correction, even if normal respiration

Fig. 24.—Boy shown in Figure 23; two years later; demonstrating the advantage that even artificial dentures were to this child as an aid to mental and physical development.

is established. We must remember that if the oral cavity and associated parts are to develop as Nature intended, the small child must breathe normally through his nose; the deciduous teeth must be kept in place, or the space be retained; the tongue must rest against the lingual surface of all the teeth, which is not possible if the child is a mouth breather, and the muscles of the cheek, lips and surrounding parts must function normally. As

dental practitioners, we are not supposed to treat conditions involving adenoids, tonsils or deflected septums or other conditions that may cause abnormal respiration. But knowing the effects therefrom, it is certainly our duty to insist that such a child see a physician. This is one of the commonest causes of malocclusion.

Martin Dewey, New York City: I have often wondered who was responsible for the confused nomenclature that we have in dental anatomy. Dr. Black was in trouble when he taught dental anatomy. He referred to the lower bicuspid as sometimes having one cusp. Later, the second bicuspids have three cusps. Also if "pre" means a matter of time, how do we justify the use of that prefix in premaxillary, in the bones which carry the incisors? There it is a matter of position. In a great many animals, they are not bicusps or tricusps—some have the function of incisors. If you think cuspids refer to single cusps, those who are familiar with fishes will find certain types of fish with cuspids all over the mouth. It is time that we adopted a scientific nomenclature, and if we are going to be scientific, we must regard the term "cusp" as a bastard term. It was ruled out by Dr. Black. Another mistake is made in the use of the terms "mesial" and "distal." The mesial surfaces of the center incisors approximate each other; the mesial surfaces of bone or anything else is the part nearest the median line, and the canine or molar is the surface farthest away. Therefore, the terms are confused. It should be the distal surfaces which approximate each other. We use anterior and posterior as being more descriptive.

Dr. Willett: I am glad that Dr. Johnson brought up that question of nomenclature, and that Dr. Dewey was here to present the other side of the matter. In the earliest contribution of mine, sent in to the *International Journal of Orthodontia, Oral Surgery and Radiography,* the galley proof went back scratched and marked up, but I finally yielded and used the terms "premolar" and "canine," although I had been taught, and preferred, the descriptive terms "bicuspid" and "cuspid." When I was placed on the committee on nomenclature of the American Society of Orthodontia, the former terms were finally accepted, and I have used them since then. I have often found that there is confusion in the minds of students or those recently graduated. They speak of a "premolar" and mean a deciduous molar. I know of schools where students go from one lecture room where they have heard "bicuspid" to the next room, where they hear "premolar," and they frequently graduate with that confusion of mind. It should be corrected. We should have one term for that tooth and use it definitely. I am optimistic in regard to the future of children's dentistry. I believe that it will come into general practice and eventually it will be on a higher plane. Dr. Grisamore spoke of the age beyond which little can be done. The age of the patient has little to do with it, in my estimation. It is the individual characteristics and individual norm that I measure in the decision as to removal or retention of deciduous teeth.

PROGRESS IN ENGLAND IN ELUCIDATION OF THE MODE OF DEVELOPMENT OF NORMAL AND ABNORMAL JAWS, AND OF THE ETIOLOGY OF IRREGULARITY AND MALOCCLUSION OF THE TEETH

By J. SIM WALLACE, M.D., D.Sc., L.D.S., F.A.C.D., London, England

UP to the end of last century, it was often said and more frequently assumed that nothing was known with regard to the etiology of irregularity of the teeth. This was not strictly correct. We at least may say that irregularity of the teeth resulting from such conditions as thumb sucking and

finger sucking was recognized, and, further, that the lack of a development of the jaws commensurate with that of the teeth was believed to be responsible for the majority of cases of irregularity resulting from crowding, though an explanation of the insufficient development of the jaws, or the mechanism of the production of the irregularity was not given or known, or was certainly not satisfactory. The normal mode of growth of the mandible, more especially, was well known to all who had followed the work of John Hunter (1771), Humphrey (1864) and Kölliker (1872). It may thus be seen that, although we had but little knowledge of the etiology of irregularity of the teeth, we did have knowledge of fundamental importance without which the elucidation of the causation of irregularity would have been impossible.

It might here be said that if we can explain why deviations from the normal occur, we can claim to have solved the etiologic aspect. Nevertheless, exact knowledge as to the mode of production of the normal being of fundamental importance, further elucidation of the exact sequence of events in the development of the normal was required before a scientific explanation of deviation therefrom could be given.

Before the end of the last century, attention began to be given to the causes of deviation from the normal, and questions with regard to heredity came to occupy the attention of those interested. The controversy on the question of the inheritance of acquired characters fascinated me, and even before taking any particular interest in the teeth, I became convinced that the lamarckian hypothesis of the inheritance of acquired characteristics was quite untenable. A little later (about 1895), after I had acquired a certain amount of specialized knowledge with regard to the jaws and teeth, the famous controversy between Herbert Spencer and Wiessmann attracted my attention (not only in a general, but also in a special way), and although unable at the time to make an explanation with regard to why the civilized jaw was apparently becoming too small to permit the regular and normal arrangement of the teeth, I remained quite convinced that the lamarckian doctrine was untenable. Similarly, I was unable to agree with the explanation that race crossing could account for this. Spencer referred to the diminution in size of the civilized jaw, and, with characteristic force of argument, brought it forward in favor of the lamarckian doctrine.

This presented me, as a follower of Wiessmann, with a problem which my daily practice tended to keep constantly before me. The study of dried skulls, jaws and bones was fruitless. It was rather incidental to my study of the value of foods requiring mastication in relation to the prevention of dental caries that the idea of a correlated cause of insufficient development of the tongue and muscles of mastication suggested that the full development of the bones of the jaw, though not primarily, was yet secondarily related to functional activity.

To say that heredity was the cause of the trouble, as Sir Charles Tomes and others did, seemed to me to be no explanation, for I took Wiessmann's definition: that "by the term heredity is simply meant the well known fact that living organisms are able to produce their like, and that the resemblance between a child and its parent, although never perfect, may nevertheless extend to the most minute details of construction and function."[1] But the diminution in size of the civilized jaw referred to certain *differences* from

1. Wiessman, A.: Germ Plasm, 1893, p. 20.

the characteristics inherent in the ancestry of man, and heredity as defined did not give an explanation of the *difference* with regard to the great frequency of irregularities among the civilized as compared with their frequency in our neolithic or more immediate ancestors. The lamarckian doctrine was no doubt said to be an explanation of the differences between the size and formation of the jaws of savages and of the civilized. Like Darwin's theory of pangenesis, this was given up by scientists, I think principally because the more closely it was studied, the less conceivable it became.

A little reflection, or perhaps a few fortunate thoughts, led me to observe that if we agreed to certain commonly accepted principles of biology, there was no need to make any assumption of the inheritance of acquired characters to give the explanation as to why the civilized jaw did not grow to the normal proportions and form which the jaws of our immediate ancestors attained. It was thus conceived that if we could, as it were, reestablish the conditions and environment of our ancestors, as far as food, mastication and correlated functions were concerned, the jaws would develop as they had done in past ages.

The biologic principles of bone growth which it seems to me it is necessary to take into account are: 1. What are now called "liberating stimuli" are to some extent necessary for the normal development of the jaws. 2. Pressure strains exercise an influence on the development and form of the jaw bones. 3. To a certain extent, the amount and position of the bone formed is dependent on its need to withstand pressure strains. 4. Functional activity of the muscles of mastication, including the muscles of the tongue, gives rise to a more complete development of these muscles. 5. Continuous pressure of the soft parts, however slight, tends to mold and modify the form of the bone wheresoever such pressure may be imposed.

As years went on, my explanation was hardly questioned, and there came to be a fairly widespread acceptance of it, although it might not have been regarded as altogether complete. About ten years ago, perhaps, a school of thought came into being which seemed to contend that some inexplicable or predestined change had been gradually suffusing itself into the hereditary makeup of civilized man, of such a nature as, it was supposed, would account for the diminution in size of the jaws. Or perhaps it might be said that it was vaguely assumed that, somehow, hormones, presumably derived from incomplete functioning of the parts, gave rise to some structural changes in the composition of the germ plasm, or the chromosomes. It may be said that it was considered that the presence of the hormones, or some environmental influence on the germ plasm, caused some change in it. Should this be granted, the assumed modifications would really be variations brought about by external influences.

That such variations might thus be brought about is generally believed, but whether they will be fixed and retained depends on whether the individual is benefited in the struggle for existence. Unfavorable variations obviously would tend to be eliminated. Up to date, we have not heard of any advantages accruing from the reduction in size of the jaw and the consequent irregularity of the teeth. On the contrary, numerous evils of varying degree are generally recognized to result. Certainly, the enormous amount of money that is annually spent on orthodontic treatment shows appreciation of this fact.

By way of getting a little closer to our subject, perhaps I may make a few observations on certain points brought forward during the last twenty-five years. It had always seemed to me to be highly important that we know more exactly how normal jaws and the associated bones grew, and that we have, as far as possible, exact measurements. To facilitate this and to coordinate measurements which might be taken on dried skulls at different age periods, I introduced the prosopometer,[2] for taking certain measurements, in the hope that someone else might do the work.

Mr. George Campion, among others, realizing the importance of this, measured the amount of growth at succeeding age periods, while, at the same time, Sir Arthur Keith was seeking, by the study of immature and mature skulls, to establish the sites at which such growth takes place. The results of their mutual work were set out in great detail in a communication entitled "A Contribution to the Mechanism of the Growth of the Human Face."[3] Curiously enough, observations on the mechanism of the growth changes were, as far as I could see, almost if not completely omitted. Together with certain important facts, some conjectures were made which do not seem to have found much favor. Evidence, it was claimed, was advanced in support of the belief that the "median sagittal suture of the palate takes a very active part in adding to the palatal width."[4] This, as we shall see, is now known to be incorrect. In the conclusions arrived at, no mention was made of heredity. The authors claimed merely to have dealt with the general nature of the growth machinery involved; and although it was indicated that they were endeavoring to show what was "the normal condition of things," the president, at the meeting at which the communication was given, pointed out that " a great deal of discussion had wandered away in the direction of abnormal and pathologic conditions."[5]

It was in the conclusion of their paper that they themselves referred to the pathologic conditions which they supposed might result from nutritional disturbances, and their effect on the normal working of the hormone growth systems. Of course, the supposed influence of vitamins in these disturbances was mentioned. If the presence of vitamins, or rather their absence, were the cause of the disturbances of the hormones leading to acromegaly, achondroplasia, etc., the human race may account itself lucky, for not one in a thousand suffers from these dystrophies. Irregularity of the teeth is, however, extremely common, and it is to some common condition that we must look for the explanation of its prevalence.

Fortunately, at the end of their conclusions, the authors admitted that "the defects which are so frequent in the growth of the English, or rather Nordic race, may ultimately prove to be the result of some deficiency or error in the dietary on which our infants and youths are reared." They continued: "No doubt, too, our modern dietary is of a kind which leaves teeth, jaws and muscles imperfectly exercised. The physical stumuli which are necessary for the normal growth of the bone are missing."

The next contribution to the subject to which I would refer is that made by

2. Wallace, J. S.: Prosopometer and Note on Prosopometry, D. Rec., 29:712-713, 1909.

3. Keith, Arthur, and Campion, G. G.: Tr. Brit. Soc. Orthodontics, 1921, p. 89.

4. Footnote 3, p. 89.

5. Spokes, Sidney: Disc. of Contribution to Mechanism of Growth of Human Face, Tr. Brit. Soc. Orthodontics, 1922, p. 36.

Prof. J. C. Brash in his lectures in 1924. This, on account of its publication under the auspices of the Dental Board of the United Kingdom, calls for more detailed consideration. In introducing the subject, Professor Brash says:

> There can be no doubt that deformities of the jaws and irregularities of the teeth are at the present day exceedingly common: an understanding of these conditions, whatever view may be taken of the causes at work, must be founded upon an accurate knowledge of the development and growth of the normal jaws. The basis of the treatment of the subject in this contribution to the growth of the jaws and palate is therefore the belief that the explanation of the mode of production, and possibly some indication of the underlying causes, of deformed jaws is to be found in the study of the normal; the basis of the study of the normal must be the principles of bone growth. . . .[6]

Professor Brash goes on to indicate the necessity of becoming acquainted as thoroughly as possible with the mode of production of the normal form, as this is at present "its most immediately important aspect." He traced the genesis of our knowledge from Hunter's time onward, and gave an excellent résumé of the mode of production of the normal form of the mandible, at least as far as it was known up to nearly the end of last century. He did not appear to have made any special reference to the subject of the development of the jaws as presented in the several editions of Sir Charles Tomes' "Manual of Dental Anatomy," wherein is indicated the amount of change, more especially in the mandible, that took place from alveolar and periosteal growth, and the conclusions arrived at with regard to the positions of the temporary dental arch and the arch formed by the permanent teeth which replaces the temporary dentition by the superimposition of the jaw of the child on that of the adult.

Nevertheless, it is on the associated changes in the position of the temporary and the permanent dentition that Brash concentrated attention in his 1924 lectures; and in order to get at more exact knowledge, he took for granted as many others have done the idea that apart from its rising with the increasing depth of the alveolar process, the first molar did not travel forward. His conclusion in this matter was evidently influenced by the study of Franke's work, and by his own madder-feeding experiments on pigs. With regard to the latter, he said, "There is no evidence that the molars move forward *in* the alveolar bone."[7]

That certain changes took place in the position of the permanent that did not occur in the temporary dentition was considered, and the views of Franke with regard to the supposed anteroposterior fixity of the first molar adopted. (Brash, nevertheless, recognized that the observed changes in the arrangement of the successional teeth *could* be attributed to the forward movement of the first permanent molar and not to flattening back of the incisors, though he did not follow up the idea.)

It is not my intention to indicate further how Professor Brash was misled by the madder-feeding experiments which he had then made, but rather to indicate the theories that he propounded with regard to the etiology of common irregularities. Naturally, he did not recognize that the forward drift of the molars accounts for the great majority of irregularities seen in practice, and he introduced the theory, to put it in a general way, that they came about as the result of a struggle for mastery in direction of the upper and lower teeth during the deepening of the alveolar

6. Brash, J. C.: Growth of Jaws, Normal and Abnormal, in Health and Disease, 1924, p. 23.

7. Footnote 6, p. 65.

process.[8] He indicated that as the upper teeth moved downward and outward and the lower upward and inward, these conflicting tendencies ultimately, somehow or another, resulted in the anomalies in position of the teeth with which we are familiar.

Partly no doubt from Sir Arthur Keith's observations and partly at least as the result of observations on the sites of growth as revealed by the madder-feeding of pigs, he regarded the growth in the median suture of the palate as the controlling factor. Viewed in the light of our present knowledge, or even the knowledge we have had for the last thirty years, this theory of Professor Brash is as untenable and devoid of appreciation of biologic principles as any of the erroneous theories yet introduced. As was noted by Meredith Lewis, "Disregard of clinical experience has resulted in investigators without dental training drawing hopelessly incorrect conclusions on dental topics, an example being, I believe, the negativing of some of Franke's careful measurements of the dental arches owing to his having overlooked the tendency of the first permanent molar to move forward."[9]

To appreciate the erroneous views of Professor Brash, it would be well, after grasping the principles of the etiology of irregularities or at least their mode of production, to read his pronouncements as published by the Dental Board in 1924. In mitigation of his errors, it may, I think, be said that Professor Brash was induced to give lectures on a subject with but about six months to learn it. He was likewise, no doubt, without such education as even the ordinary dentist is given in this specialized branch of knowledge. I fancy, too, that he was unacquainted with the views which I had brought forward in the opening years of the century.

Though the subject of this communication is to some extent historical, I need hardly refer to the views which I then put forward. They are, as you know, essentially the same as those which were given in greater detail in my book on "Variations in the Form of the Jaws, with Special Reference to Their Etiology and Their Relation to the Occlusion of the Dental Arches." (1927.) This is the next contribution to the subject to which I would refer. One of the things that distinguished it from my first book on the subject[10] is the inclusion of a somewhat long account of the postnatal development of the normal jaw.

I cannot here, of course, go into detail and I shall refer more particularly only to one point, which is that, in the normal development of the jaws, the first molar does move forward in the alveolar process, and that there is no flattening back of the incisors. Nor is there the slightest evidence of the forward growth of the incisors at an angle of from 20 to 45 degrees to the horizontal, as in the snout of the pig. In fact, we cannot argue in detail with regard to many changes which take place in the pig with reference to the growth of the human jaws. We can watch and record the changes which normally take place in the human mouth, with advantage. This is what I happened to do, and by some it was supposed to be the most important part of my contribution to the subject, although, with reference to this, Sir Arthur Keith said, "The exact measurements made on the growing jaws . . . from infancy to

8. Footnote 6, p. 83.

9. Lewis, Meredith: Monograph and Its Critics, Brit. D. J., 52:129 (Feb. 2) 1931.

10. Wallace, J. S.: Essay on Irregularities of Teeth, with Special Reference to Theory of Causation and Principles of Prevention and Treatment, 1904.

full adult years are valuable, but it is rather to his observations, to his opinions and to his experience that his work owes its chief attraction."[11]

There may have been a few attempts to support the views of Franke and Professor Brash, but the truth of the theory that the first molar does move forward *in* the alveolar bone is now fully established. The further theory that the crowding and irregularity of the teeth in front of the first molar which is characteristic of the great majority of the irregularities with which we are acquainted (even though none of the temporary teeth or their successors have been lost) is now, as we shall see later, coming to be fully accepted, and its importance in treatment recognized. With the collapse of the theory that the first molar does not move forward, there is, of course, a collapse of the theory of the flattening back of the incisors, of the "struggle for mastery in direction" in the upper and lower dental arches, and in the supposedly dominant factor in the growth of the median suture between the two maxillae.

Take another aspect of the subject. It may be remembered that, in 1924, Professor Brash admitted[12] that he was far from suggesting that the growth and pressure of the tongue was to be neglected as a factor. Let us now turn to his more recent lectures delivered in 1929.[13] Strangely enough, in these it would appear that he now does not believe that the growth and pressure of the tongue is an important factor in the development of the jaws and the molding of the dental arches, notwithstanding the fact that he gave this as the alternative theory to that which he propounded in 1924, and that additional evidence has in the meantime been brought forward to support it.

As already noted, Brash now abandons the theory of the influence of the tongue and brings forward a case of an achondroplastic fetus which he thinks is rather convincing, for in it he indicates that the disturbance of growth at the base of the skull was responsible for lack of room for the tongue to occupy its normal position (as no doubt it was). Yet he recognized that the irregularities and the malocclusion which are so prevalent at the present day must be due to some widespread factor. Is achondroplasia widespread in civilized man? How many have seen a single case? I had recognized that developmental aberrations (mostly of rare occurrence), such as "incomplete formation of the tongue, macroglossia, and acromegaly,"[14] would result in abnormal variation of the jaws and malocclusion of the teeth; and though I have never seen a case, nor am I likely to see one except in a museum, achondroplasia may be added to the list.

Professor Brash says,

> The evidence of examples of congenital "absence of the tongue" associated with underdeveloped and malformed jaws is beside the point, since these must be placed in the category of malformations of the mandibular arch. (Fig. 97, p. 117.) Hypertrophy of the tongue, on the other hand, is not necessarily the direct cause of an associated enlargement of the jaw; they may both be due to a common cause.[15]

There was no suggestion of absence of the jaws in the case to which I referred, only the narrowing one would expect as the result of the absence of the tongue, and to say that "these must be placed in the category of malformations of the mandibular arch" is surely a strange observation, since the central part of the

11. Keith, Arthur: Man, 27:210-211 (Nov.) 1927.

12. Footnote 6, p. 83.

13. Brash, J. C.: Aetiology of Irregularity and Malocclusion of Teeth, 1931, pp. 204-206.

14. Wallace, J. S.: Variations in Form of Jaws, 1927, p. 259.

15. Footnote 13, p. 205.

tongue is not developed from the mandibular arch, and his references to a figure of an agnathic fetus seem therefore to be quite beside the point.

The subject is too long to discuss here, but if those interested would consult the evidence brought forward by Professor Brash (1929),[13] and that which I gave in my book on "Variations in the Form of the Jaws" (1927),[16] I have not the slightest doubt as to the views any serious student of the subject will adopt.

Then again with regard to the supposed stationary position of the first molar anteroposteriorly, Brash admitted in 1924 the alternative that it might move forward in the jaw. Now that he admits this, he does not appear to follow it up, although assuredly it is recognized that the mode of production of the normal is highly important, not only as a link in the chain which leads to the recognition of the etiologic factors, but also from the point of view of treatment. What is the rationale of his silence on this subject? Is knowledge of the mode of production of the normal or of irregularity to be abandoned as of no importance?

Now let me refer to functional activity as it may affect the tongue, the muscles of mastication and the jaw bones. It is generally recognized that although the muscles and bones are primarily laid down from what might be called purely hereditary forces, or at least that functional activity is not a factor in the earlier part of their development, it is also recognized that in postnatal life functional activity has within limits some effect on the development of muscles and likewise on bone. There is what may be called the hereditary normal size of muscles for each individual, though there are considerable variations within the normal. In addition to this, there are variations due to functional activity. A certain hypertrophy for example, in the blacksmith's arm, and, on the other hand, a certain atrophy when the muscles of the limbs are but little used. Nature appears to provide for generally expedient variability of this kind, and this would appear to be normally present for all.

The widespread general condition which the dental profession has come to recognize as influencing to some extent the development of the muscles of mastication and the tongue, as likewise of the jaws, is brushed aside by Professor Brash, notwithstanding the fact that experimental evidence has been brought forward which shows that, during the development of the dental arches, when one side is rendered functionally inactive, it does not grow so completely as does the side which is functionally active. This has been shown experimentally in three ways: (1) by extracting the teeth on one side of the mouth; (2) by filing down the teeth on one side of the mouth, and (3) by cutting the muscles of mastication on one side, in order to render them useless. The evidence of these three methods indicates fairly conclusively, in varying degree, the relationship of the growth of the bones involved and the mechanical forces of functional activity. Apparently in opposition to this view, Professor Brash refers to lopped rabbits' ears, and their influence on the development of the skull. Does not this obviously show the effect of disuse on one side of the muscles which normally hold the ear erect and the relationship of lopsided mechanical forces, and on the vital activities which these influence? With regard to this, Darwin said,

> The lopping downwards and forwards of the immense ears of fancy rabbits is in part due to the disuse of the muscles, and in part to the weight and length of the ears, which

16. Wallace, J. S.: Variations in Form of Jaws, 1927, pp. 41-42, 113-114.

have been increased by selection during many generations. Now with the increased size and changed direction of the ears, not only has the bony auditory meatus become changed in outline, direction, and greatly in size, but the whole skull has been slightly modified. This could be clearly seen in "half-lops"—that is rabbits with one ear alone lopping forward —for the opposite sides of their skulls were not strictly symmetrical. This seems to me a curious instance of correlation between hard bones and organs so soft and flexible, as well as so unimportant under a physiological point of view, as the external ears. The result is no doubt largely due to mere mechanical action, that is to the weight of the ears, on the same principle that the skull of a human infant is easily modified by pressure."

Would it not have been more in accord with Professor Brash's previous statements if he had said that in the "half-lops," we might be justified in saying that "there is no more compelling instance of the domination of the soft tissues over bone."[18] To those who are acquainted with the principles of bone growth already indicated, we see in the lop-ear rabbits nothing but confirmation of them. It might be argued that the lop ears are long and heavy as a result of artificial selection, and therefore there is an hereditary element to be considered. No doubt this is so, but neither artificial nor natural selection can be said to have been at work in reducing the civilized jaws to such an extent as to jeopardize the normal arrangement of the teeth. Professor Brash's objections to the inferences which can but be drawn from these observations rather enforce than militate against the theories which we hold, and we need not refer to them further. Moreover, he does not seem to have been acquainted with or realize that the importance of the convincing evidence lies in a comparison of the mandible of the edentulous and that of those who have the dental apparatus in full functional activity. It is not only the alveolar part that is affected: the whole of the mandible atrophies to a marked extent, and this is specially noticeable at the angle, which becomes much less rectangular.

In general, it may be seen that the part of the mandible which is most affected from atrophy on account of partial disuse is that part which is more especially stimulated to grow as the result of functional activity. But it is generally insufficient growth at the angle and posterior borders that makes it difficult, if not impossible, for the molar teeth to come into position without crowding and encroaching on the space, which should be retained for the teeth in front of them. It is curious that Professor Brash should have overlooked this point, as it is figured by the superimposition of the aged jaw on the full functional mandible in Tomes' "Manual of Dental Anatomy," which is given in his references.

Brash seems to question the contention that savages eat foods which demand more vigorous mastication than those in which the civilized indulge, and refers to certain African tribes "whose staple food was a sort of jelly-like porridge which required very little mastication; and yet . . . the facial configuration of these people did not show any lack of muscular development." (Rushton, B. S. S. O. 1920.)[19] The latter part of this statement is certainly true, and it is also true that the teeth are highly polished and show ample signs of attrition from the hard use to which they are put. The late Dr. James Wheatley once remarked to me that this was quite sufficient evidence for him that these Africans eat food which promotes mastication.

When this argument about mealy food and the supposedly soft food of savages

17. Darwin: Animals and Plants under Domestication, 2:324-325, 1868.

18. Footnote 6, p. 61.

19. Footnote 13, p. 202.

was first brought forward, I went to some trouble to find out a little more about the nature of the diet of the South African native, and I found that it was far coarser and more fibrous than porridge as we know it; that it promoted mastication very effectually, and, moreover, that the African natives ate several other things requiring mastication. Thus, when they get the chance, "according to Gardener's estimate, four or five Kaffirs can manage to eat up a whole ox—entrails, sinews and all—in a day and a half."[20] It requires a long time to overtake an erroneous statement. Just recently, this jellylike porridge myth was repeated by Dr. Lennox in the *South African Dental Journal,* but it brought out the questions, "May I ask Dr. Lennox, has he observed a native eating, say, mealie meal? Has he noticed that each mouthful is thoroughly chewed and salivated?"[21]

It seems to me that, for some reason, Professor Brash has, in his last book, evidenced a reluctance to accept as sufficient evidence that runs counter to his thesis. It is a mistake to belittle or reject well-sifted evidence or to ignore it altogether. Toward the end of 1925, Dr. T. D. Campbell published one of the most outstanding contributions to our knowledge in his book "The Dentition and Palate of the Australian Aboriginal." In his summary, he said, "Probably the chief benefit derived from such a study . . . is the great lesson to be learned, namely, that if modern civilized races are to preserve strength and contour in the lower architecture of the face . . . there will have to be some drastic changes in the present day dietary and method of food preparation."[22] Notwithstanding the most voluminous references given by Professor Brash, this very important work is not included. He does make special reference to another race, and notes that it has often been stated that "the jaws of the Eskimo exhibit clearly the influence of muscular activity." He asks, "Do all Eskimo children chew perpetually?" (I do not think that anyone ever said they did.) He then asks, "Is there any serious evidence to show that their jaws do not develop their characteristic form if they do not?"[23]

Perhaps the evidence with regard to the Eskimo, when these questions were put, was not sufficient, but what about the evidence brought forward at the Second International Orthodontic Congress, at which Leuman M. Waugh showed films which illustrated in the most striking manner the fact that when brought up on civilized foods, as they now are in certain places, the Eskimo children showed teeth with the irregularities and malocclusion that we are accustomed to see in our daily practices? No doubt whatever the diet, some children will exercise their jaws and teeth more vigorously than others. Some, like the Eskimo children, will gnaw leather or what not if they get the chance, and different degrees of crowding of the teeth may come about to some extent from this fact alone, although, of course, there are other factors such as ill health, disease, premature loss of teeth and heredity, which affect the growth of the muscles of mastication and the tongue, in addition to the nature of the food from the point of view of mastication. Col. T. Hunter has acquainted me with the fact that the Maori race demonstrates also

20. A fuller account of this inquiry and associated discussions is given in Wallace, J. S.: Supplementary Essays on Cause and Prevention of Dental Caries, 1906, pp. 14-15.

21. Adams, B.: Some Notes on Diet and Teeth, So. Afr. D. J., 4: (Nov.) 1930.

22. Campbell, T. D.: Dentition and Palate of Australian Aboriginal, 1925, p. 117.

23. Footnote 13, p. 201.

that immediately the civilized diet is adopted by them, they too become subject to irregularities, and in a degree greatly exceeding those of their parents. Surely all this indicates something other than hereditary conditions as the cause of irregularities, even though we admit that the type of irregularity may be determined by hereditary conditions, disease involving loss of teeth, etc.

I may here allude to liberating stimuli, to which apparently Brash has not directed his attention. Biologists recognize their importance. Thus, Sir J. Arthur Thomson says, "In childhood, the most important thing is that there should be a succession of what are called liberating stimuli. Simple examples of that are, a crust of bread for the teeth; chalk for the budding artist; mechanical toys for the boy who inclines that way; the doll for the girl, and the garden for both."[24] Had Sir Arthur been expatiating on teeth and jaws, he would no doubt have referred to the food which promotes their functional activity.

Professor Brash would apparently have us believe that ordinary irregularity of the teeth is hereditary. No doubt, the early development of the jaws may be said to be practically entirely the result of hereditary forces, the necessary environment being constant. No doubt also are the form and size of the teeth, as these, too, are formed totally independently of functional activity. No doubt, too, functional activity itself is to some extent at least the result of inherited tendencies.

In my classification of irregularities, the first class, designated as "developmental aberrations," were recognized in some instances to be hereditary. This class included "such abnormalities as aberrant canines directed upwards towards the floor of the orbit, premolars taking the place of lateral incisors and *vice versa,* absence of one or more teeth or redundant numbers, abnormalities associated with hare-lip, the absence or incomplete formation of the tongue, macroglossia, and acromegaly,"[14] and inferentially would include developmental aberrations, such as achondroplasia, and the weird teratologic specimens which fortunately we never see in life, notwithstanding the great significance attached to them by Brash in explaining what we see in almost every case of irregularity that we have to treat. I wonder if he now thinks that these rare dystrophies are really supposed to throw any light whatever on what we have to deal with. There is little fear of their becoming hereditary. Nature makes short work of variations which "overshoot the mark." These types of irregularity in development are absent in the ordinary malocclusion with which we are familiar, such as general crowding, postnormal occlusion, and prenormal occlusion.

Dealing with illness and malocclusion, Professor Brash says, "it is quite certain that there is no evidence whatever to show that any particular affection has any special relation to malocclusion."[25] I wonder if he is aware that dental caries is the most widespread of all diseases in civilized communities, and that the premature loss of teeth (more especially the deciduous molars, which are most frequently the teeth affected in childhood) is recognized by practicing dentists to be a very obvious and fruitful cause of irregularities and malocclusion.

I wonder, too, whether he realizes that in civilized communities, even where the climate is cold and damp, young children, unlike the offspring of almost all other

24. Thomson, J. A.: Daily Telegraph, Aug. 5, 1931.

25. Footnote 13, p. 152.

mammals and of birds, are isolated from the warmth of their mother and subjected at night to the vagaries of "fresh air fiends," so that colds in the head are common, and that colds are associated with blockage of the nose and consequent interference with sucking, gnawing and mastication. Unfortunately, blockage of the nose from having the infant to sleep with the window open, even though the weather is not severely cold or damp, may occur within twenty-four hours of birth, as I now know, but to my great regret did not in the early years of the present century. As to whether the view of the dental profession or of Professor Brash will prevail on this subject, which I have gone into more fully elsewhere,[26] we may with confidence "wait and see."

Now let us consider the suggested explanation of Professor Brash regarding the etiology of irregularity and malocclusion. It would appear that he has reverted to the old idea of heredity and race crossing.[27] Of course, to say that any characteristic is hereditary is no explanation as to how it originated. Race crossing, or hybridization, might be supposed to supply an explanation of a kind. This idea is not new; in fact, it to a great extent inspired the investigations of an earlier generation, about forty years ago, when I was a student. The evidence that race crossing is not a cause, or at least not an important cause, of irregularity, is indicated even at the present day by the well-formed jaws of the Eurasians. Moreover, race crossing has been quite common for countless generations, but it is only since the introduction of machinery that irregularity and malocclusion of the teeth have become so very prevalent. Machinery has led to the establishment of flour mills, sugar refineries, etc., providing corresponding articles of diet; which, together with cow's milk, permitted the disastrous "pap" feeding system of weaning and feeding children to become widespread in civilized communities.

The main question as to whether inheritance or environment, nature or nurture, is responsible in a broad way for malocclusion and irregularity in the position of the teeth, has been amply discussed, with the result that the views of those who have maintained the environmental influence have become recognized as correct, and I fancy will remain so. I have no intention at present of going into the question again or raising new questions, such as how it came about even as late as the Iron Age that though the brachycephalic with the broad jaw intermarried with the dolichocephalic with the narrow jaw, yet the offspring never showed misfits in the region of the condyle; nor why, for example, identical twins are practically certain to present the same irregularities if brought up in a similar environment. All I would do is to suggest that anyone who aspires to place his knowledge of etiology in orthodontics on a scientific basis read and digest the views of the chief exponents of both sides of the question.

That Professor Brash has given us an elaborate and learned exposition of the subject from the point of view of heredity, it is needless for me to say. Nevertheless, I would urge the study of what he calls the "provisional hypothesis of environmental influence in the wide sense." As I have gone into this question somewhat fully in my recent work on "Variations in the Form of the Jaws," to which, notwithstanding our differences, Professor Brash has paid tribute,

26. Wallace, J. S.: Prevention of Common Diseases in Childhood (Open Windows and Adenoids), 1912, pp. 57-59.

27. Footnote 13, p. 96.

this book might be chosen for perusal. If the greatest scientists in the field of anthropology in England and America, such as Sir Arthur Keith and Dr. Ales Hrdlicka, have taken the trouble to read, review and commend it, surely those of you who are interested in the welfare of your patients and your own prestige might hope to get some return from it. Be this as it may, nothing is more certain than that a correct appreciation of the etiology of the irregularity of the teeth helps materially in diagnosis and treatment.

The whole question is undoubtedly of great importance, for on the appreciation of the truths which emanate from its study will depend the teaching of the future, whether it be with regard to eugenics or to the nurture and rearing of children. Moreover, it is but part of a larger question. It is correlated with the two other widespread diseases of the teeth, pyorrhea and dental caries, and it is also associated with questions relating to oral sepsis, alimentary malhygiene and systemic disease originating therefrom.

It is also closely associated with the development of the beauty in form of the greater part of the human face. It is too but a local manifestation of the more general fact that certain common diseases resulting from dietetic theories and practices of the immediate past have had a prejudicial effect on bodily development. It may certainly be said that notwithstanding the idea that disease and loss of teeth and consequently loss of function, in early life, is of little significance in the production of irregularity, we clinicians have the importance of this factor forced on us in our daily practices. Heredity and hormones no doubt play their part in the development of the jaws, etc., but what evidence have we that these are different now from what they were in prehistoric times when irregularity of the teeth was rare, and what control have we over them? And why, may it be asked, should the first experimental test[28] based on a return to a more natural system of dietetics and hygiene produce results exactly in harmony with the theory which I hold? Why should not other children or groups of children be subjected to the same test?

Love laughs at eugenics, as was noted in a criticism of Professor Brash's recent book,[29] but love does not laugh at protruding incisors, receding chins, outstanding cuspids, and zigzag incisors with correlated variations of discolorations of the front teeth. Nor does such ugliness as is usually associated with ill-health, frequently resulting from the errors which give rise to disease and malocclusion, appeal to those who think of matrimony. For want of correct guidance, millions of maidens are having their future careers thwarted or even ruined; and I do not think men escape the misfortunes associated with an ugly face. If the prevention of malocclusion is hopeless except by the application of eugenics, the problems of etiology become merely of academic interest.

Those who here and now desire to see the best results are not likely to be inspired by unsolved hypotheses of the mechanism of genes, gametes and chromosomes. From the purely professional point of view, the etiology of malocclusion as recognized by the school to which I belong has provided the practitioner with an explanation of the mode of production of irregularity of the teeth, together with, or as an integral part of, the etiology. Professor Brash, in his last book, hardly attempts this at all, important as he originally recognized it to be, and the book

28. Footnote 14, pp. 69-93.

29. Irregularity and Malocclusion of Teeth, Brit. M. J. 2:617 (Oct. 3), 1931.

as a whole gives one the impression of misdirected attention on almost all questions relating to the etiology and prevention of the common types of irregularity and malocclusion of the teeth, rather than an explanation of them. This may be satisfactory for those who wish to justify further research on lines which in the past have led to little else than confusion and erroneous beliefs, but it is of no use for dental surgeons or for those who hope to bring up children without the blemishes—often quite serious—which disfigure the present generation so generally.

What use is it to be told that if we find out a hypothetical something about the mysteries of heredity, it *may* be of use to us in orthodontic practice? Have we to wait patiently for another Mendel, and then perchance to wait for another fifty years till scientists appreciate his discoveries? What use, too, is it to those whose business it is to disseminate knowledge for the prevention of the trouble? Before the etiology of dental caries was known, the facile explanation, or rather evasion, was that it was hereditary. Now that we know the mode of production of the disease and its etiology, we are able to prevent it even though we recognize how hereditary peculiarities, such as certain forms of teeth—those with pronounced carbohydrate retention areas—may predispose to the disease.

Similarly, although those who think with me recognize that, at times, certain hereditary peculiarities associated with the form of the teeth and the growth of cartilage and bone may affect the production of irregularities, we do not by any means throw up the sponge in despair and say that the irregularity of the teeth *in general* is hereditary and cannot be prevented, any more than we would say that caries is hereditary and cannot be prevented. No, a totally different attitude is taken. We believe that irregularity of the teeth can generally be prevented by simple common sense means, and the value of "Orthodontic Treatment Based on the Newer Theory"[30] is recognized and has already been put to excellent use, while the harmfulness of "Some Theories Obstructing the Progress of the Science of Orthodontics"[31]—such as the supposed anteroposterior fixity of the first molar—has been clearly demonstrated.

There is a consideration often overlooked by laymen and even professors with regard to heredity. The normal and useful are much more rigidly hereditary than the abnormal and detrimental. The transmission of all the normal characteristics of men and animals is so general that it fails to attract attention and is usually overlooked. Whether hereditary or not, abnormalities attract attention. Some abnormalities are hereditary, at least for a few generations, and since they are striking and because they differ from the ordinary, the man in the street refers to only these peculiarities as being hereditary, forgetting that all normal characters, e.g., two legs, two eyes and two arms, are all hereditary, and that with far greater certainty than occasional abnormalities, striking though they may be. Brash does not seem to recognize that an abnormal environment, such as is conditioned by the withdrawal of the necessary and normal liberating developmental stimuli, gives rise to abnormal characteristics which need never occur, or recur generation after generation as they frequently do in the artificially abnormal environment of civilized man.

30. Grieve, G. W.: Detail of Orthodontic Treatment Based on the Newer Theory (demonstration given at the Second International Orthodontic Congress, July, 1931).

31. Grieve, G. W.: D. Rec., 51:287 (June) 1931.

In his concluding remarks, Professor Brash suggests that "the time has arrived to substitute for the provisional hypothesis of environmental influence in the wide sense—which appears to have inspired most of the investigations and most of the discussions that have taken place in the past—the other provisional hypothesis that irregularity and malocclusion are inherited conditions and to let that inspire future discussions and future investigations,"[32] Notwithstanding my long continued interest in the problems of heredity, and my hope that biologists may continue to investigate this subject, including further investigation of the theory of the prepotency of the fittest,[33] I object to the suggestion that we should *substitute* the provisional hypothesis that irregularity and malocclusion are inherited conditions and to let that inspire future discussions and future investigations. Through careful and patient investigation, we have arrived at the etiology of the various types of irregularity which will bear comparison with the solution of other biologic problems which are generally accepted as correct by scientists.

32. Footnote 13.

33. Wallace, J. S.: Tr. Roy. Soc. Med., 1: 120, 1908.

I would therefore suggest that we continue to let ourselves be inspired by the biologic principles associated with environmental influences which have in the past carried us so far to a successful and useful explanation of the causes of irregularity of the teeth. We are now entering the era when the unification and simplification of knowledge are coming to be recognized as urgently necessary for the further advance of science and the etiology of irregularity seems to me to be part of the great problem associated with the rearing of a healthy race. To my way of thinking, the subject must be associated with the recognized principles of biology (*re*growth of bone, pressure strains, etc.), and we as dentists can show its intimate association with the other diseases of the teeth, caries and pyorrhea, together with the diseases to which these give rise. We can as the result of our inspiration from environmental influence in the wide sense so coordinate our methods of prevention as to fall in line with the methods which are necessary for the prevention of correlated diseases, and thus unify practice as well as the knowledge on which it rests.

THE LOCK-PIN PORCELAIN INLAY*

By D. HOYT SIMPSON, D.D.S., Atlanta, Ga.

RECENTLY, there has been a backward trend in esthetic dentistry. Discouraged by the insufficient retentive quality of the baked porcelain inlay, we are resorting to use of the various silicates and combinations of gold and silicate to restore incisal contour in anterior teeth.

When the corner of an anterior tooth is broken off, whether owing to an encroaching carious contact, disintegration of silicate, chipping or abrasion or any

*Presented as a clinic on ceramics at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 22, 1931.

one of the many causes of approximo-incisal cavities, what is to be done? (Fig. 1.) Insert a gold inlay, place a contour silicate or restore with baked porcelain? This is one of the most difficult problems of restorative dentistry. Owing to the fact that means of retention are inadequate, we hestitate to place baked porcelain inlays in anterior teeth and, at times, jacket crowns have been resorted to in order to insure serviceable restorations.

The nature of baked porcelain discourages an angular preparation, which is our mode of retention in other materials. The incisal step or lingual lock,

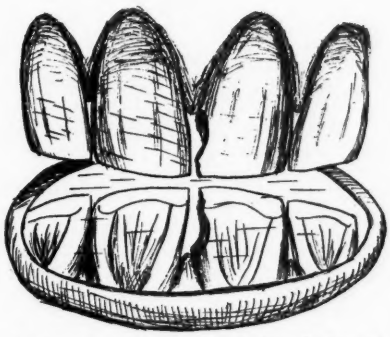

Fig. 1.—Destruction of incisal angle through fracture, caries, chipping, abrasion, etc.

therefore, affords a weak resistance to stress; the porcelain being easily fractured. This type of preparation calls for more or less extensive destruction of sound tooth substance.

In searching for some method by which sufficient retention may be accomplished, coupled with a minimum destruction of tooth structure, I hit upon a lock-pin and tube technic. This type of inlay calls for a minimum loss of sound tooth structure, and when the pin is inserted through the tube into the tooth, there is a sufficient amount of resistance to stress. It permits the baking of a more compact, solid type of inlay. The margins approach nearer a circle, which eliminates the contraction or pull, as in dovetails or steps. The more simple a baked porcelain inlay, the easier it is to bake; as, for instance, the oval or round cervical inlay. The use of the dovetail or dollhead on the lingual surface would cause a contraction of porcelain toward the main body, which is usually in a different plane, thus resulting in a tendency to warp the retentive portion. This can be eliminated by the lock-pin and tube type.

PREPARATION

In preparing the lock-pin inlay, we first remove the decay or old filling to determine the outline form and, secondly, smooth the margins at right angles to the surface of the tooth. The cavity outline on the labial and lingual surfaces should be flowing curves, not sharp angles. (Fig. 2*A*.) This is necessary for esthetic reasons as well as for a consideration of shrinkage. Next, a well or shallow box is made on the gingival seat. (Fig. 2*B* and *C*.) A round bur (No. 1 or 2) is used, to avoid angles, and the depth should be approximately 1 mm., so that the platinum may be burnished into this concavity. A groove running parallel to the long axis of the tooth is next made with a small fissure bur (No. 700L or 701). The groove extends from near the linguo-incisal angle to the bottom of the gingival well. (Fig. 2*D*.) The groove should not extend to the surface of the tooth or margin of the cavity, but if it does, a sandpaper or carborundum disk can be used to eliminate this irregularity on the margin. (Fig. 2*E*.) This axial groove or step offers resistance to a labial or lingual thrust. In the upper teeth, the

force of mastication is principally toward the labial aspect.

Position of Pin.—The next step, the placing of the hole for the lock-pin, is very important. It should be made in the dentin as nearly at right angles to the long axis of the tooth as possible. (Fig. 2*F*.) Do not endanger the pulp by a deep pin hole nor aproach too near the labial surface. The No. ½ round bur is used, corresponding to a 22-gage or 0.025 wire. The depth of the pin hole need not be over 1 mm. It is better to consult a roentgenogram before making this retention as the pulp may be abnormally large. Sufficient bulk of porcelain must be allowed between the pin and the incisal edge as well as the occlusion of opposing teeth. Ordinarily the tube would run nearly through the center of the inlay. By placing the shank of the bur against the marginal ridge of the approximating tooth, enough thickness of porcelain would usually be allowed. If the bite is close or the arrangement of the anterior teeth such that sufficient porcelain could not be baked over the tube, changing the position of the pin or altering the opposing occlusion may be considered. The opening of the tube should be on the approximal surface near the marginal ridge, and about midway between the incisal angle and the gingival margin. (Fig. 2*G*.) The direction of the pin would naturally be diagonally across the tooth from the linguoproximal angle toward the opposite labioproximal angle, owing to the accessibility of the bur and pin. (Figs. 2*H* and 3.)

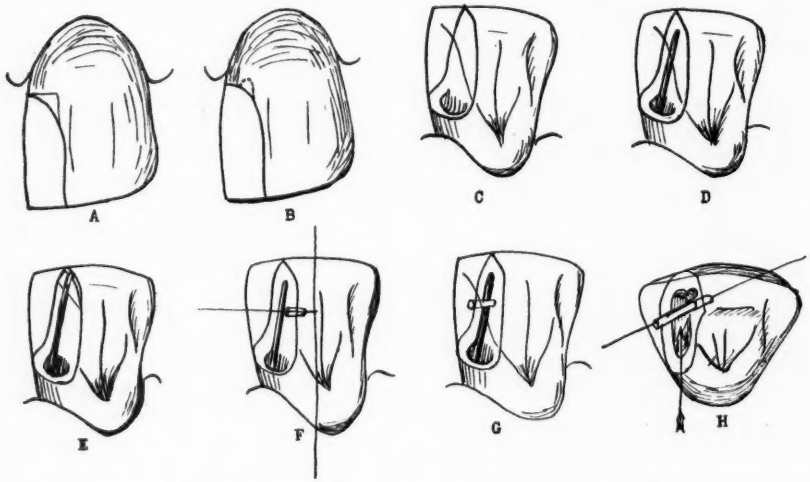

Fig. 2.—*A*, use of flowing curves, and not sharp angles, for cavity outline both on labial and on lingual surfaces. *B* and *C*, gingival well retention. *D*, axial groove for retention. *E*, groove removed from margin with disk. *F*, position of pinhole at right angles to long axis of tooth. *G*, position of tube opening on surface of inlay. *H*, incisal view with line drawn to show direction of tube from linguoproximal diagonally across tooth to labioproximal angle. The arrows show the principal direction of stress.

Fitting Pin.—After the pin hole is placed, a piece of 22-gage or 0.025 wire,

either gold or any other nontarnishable metal with strength enough to withstand the shearing stress, may be fitted. I prefer the stainless steel wire used in orthodontia. A piece of wire 1 inch long is bent at right angles at the end in order that it may be held while being placed in the mouth. Next, a suitable copper band smaller in circumference than the tooth is selected. A V-shaped cut is made, deep enough to allow the margin of the band to pass below the gingival margin of the cavity. The bottom of the V forms a definite seat for the band. The band may be trimmed to fit the tooth as shown in Figure 4*A*.

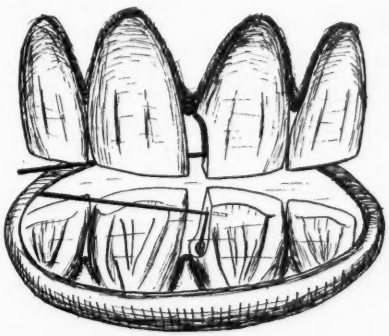

Fig. 3.—Relationship of pin to approximating tooth.

Preparing Band.—A hole is next drilled through the band at the point of entrance of the pin. The position of the hole may be determined by the relation of the pin to the approximating tooth, with carbon paper or wax. The pin is then inserted in the tooth through the hole in the band. (Fig. 4*A*.) After the cavity is lubricated, a cone of modeling compound is warmed and pressed into the band to obtain the impression. Care should be exercised to have the compound soft enough on the tip and the band and pin properly adjusted so as not to bend the pin in taking the impression.

Removing Impression.—The impression is now chilled and the pin removed. The impression cannot be removed until the pin has been removed, as it locks the band in the same way as it does the finished inlay. The impression should be easily removed if there are no undercuts and preparation is properly made. We reassemble the pin and impression and seal the pin in position with sticky wax on the outside of the band. If the pin extends inside the impression farther than in the tooth, no harm is done, provided the direction is correct. Shellac or wax may be applied to the portion of the pin inside the impression to permit withdrawal from the die. A wax bite and plaster impression containing a band impression are taken. Also, the shade and markings are recorded.

LABORATORY TECHNIC

A wax collar is adapted to the impression band and the whole invested in plaster, the bent end of the pin being left out of the plaster. (Fig. 4*B*.)

Packing.—We mix a good grade die alloy, using the soft amalgam jarred or vibrated up to a point above the pin and margins of the impression, followed by packing the dry amalgam and removing all excess mercury.

Separating.—In separating the die and impression, the operator must be sure to first remove the pin. After removing the plaster, the die is warmed and the copper band and impression are removed. The die is trimmed and inserted in the plaster impression in a manner similar to that employed in the porcelain jacket procedure, and then a cast is poured. This is mounted on a bridge articulator using the wax bite.

Baking.—A matrix is swaged as for

a simple inlay and baking may start. The porcelain must not extend to the pin hole on the first bake. The pin may be inserted in the die to prevent porcelain getting in the hole. We remove the pin, serrate and bake. (Fig. 4*C*.) After the second application, to fill the serrations, the pin may be removed and the matrix reswaged. The box or well must be filled, as this is part of the retention. body of the inlay has been built up almost to the pin hole or approximately half the inlay, the tube may be inserted. This tube is made by rolling a small piece of platinum twice around the pin. The length of the tube may extend beyond the proposed surface of the inlay. The pin is inserted in the die with the tube extending only to the platinum matrix. (Fig. 5.) The tube is sealed

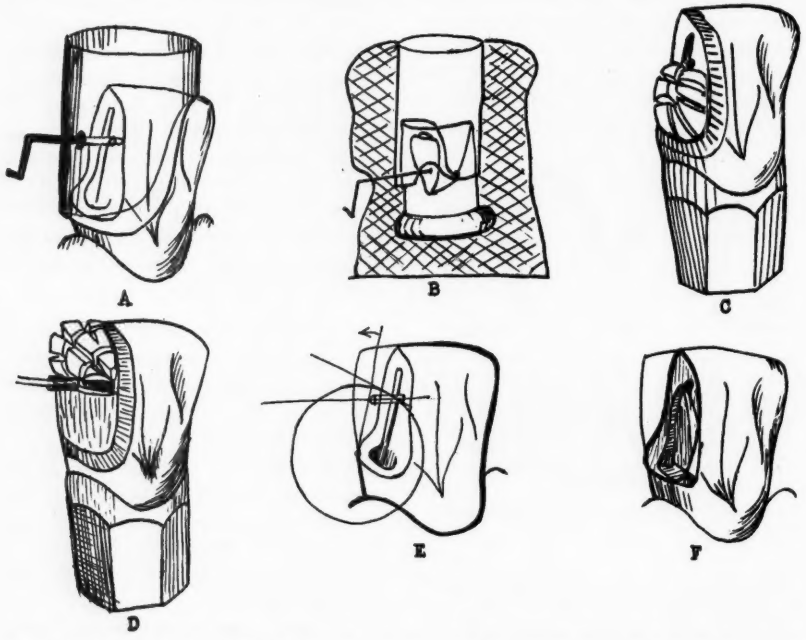

Fig. 4.—*A*, copper band fitted to tooth; pin inserted into tooth through hole in band. *B*, impression with wax collar invested in plaster block; pin exposed through plaster. *C*, first layer serrated and ready to bake. *D*, tube waxed in place, porcelain added and serrated down to wax. *E*, geometric position of pinpoint outside circle of movement, using margin as center of circle. Resistance to tipping is greater than if the pin lies in the circumference of the circle. *F*, gold foil preparation with three "potlegs."

If the platinum has torn at this point, new porcelain may be added from the inside or tooth side, provided the platinum is not covered.

Incorporating the Tube.—When the to the matrix with a touch of sticky wax, preferably on the lingual side. The porcelain is built around the tube and serrations are made down to the wax. (Fig. 4*D*.) We remove the pin, leaving

tube incorporated in porcelain, and carry into the furnace slowly as the wax evaporates. The matrix cannot be swaged after inclusion of the tube. We finish building, shaping and adjusting till ready for the trial in the mouth.

Adjustments in the Mouth.—We try

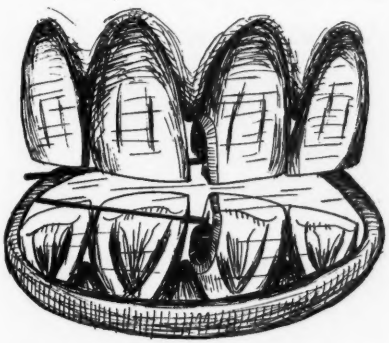

Fig. 5.—Pin inserted in die with tube extending only to matrix. The tube is sealed to the matrix on the lingual aspect with sticky wax.

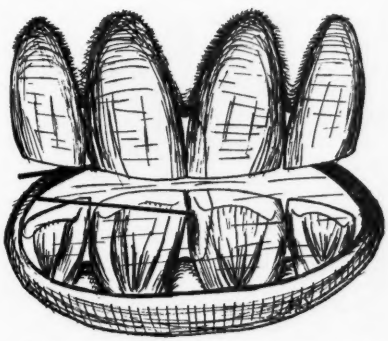

Fig. 6.—Inlay cemented in tooth and pin ready to be cut off with disk.

the inlay in the tooth without the pin, in order to check the contact and occlusion. If the contact is too tight, we do not force the inlay to place, but make the necessary adjustments. Cardboard carborundum disks prove very satisfactory agents in making the adjustments. The garnet and cuttlefish disks aid in finishing. About 1 mm. excess margin of platinum is left on the inlay, in order that new margins may be baked if the inlay should not fit snugly. The margins

Fig. 7.—Cavity prepared and pin inserted to show relation to adjoining tooth.

Fig. 8.—Position of band and pin after taking impression. The pin locks the impression in place as it does the finished inlay.

are burnished in the mouth and the pin is tried in to determine whether everything works properly. As soon as the shade, occlusion, contact, margins and

pin are adjusted, the final bake or glaze may be applied. I prefer a low glaze rather than a high one. Also, I dress off the glaze on the labial aspect after setting the inlay. This reduces the reflection and, in the majority of cases, improves the appearance. Alpine points or Arkansas stones are used for this. I wish to have a glazed surface on the approximal and lingual aspects, especially near soft tissue.

Peeling, Etching, Etc.—A drop of water applied to the inlay makes peeling very much easier. The platinum seems to leave the porcelain much better than when an attempt is made to peel the

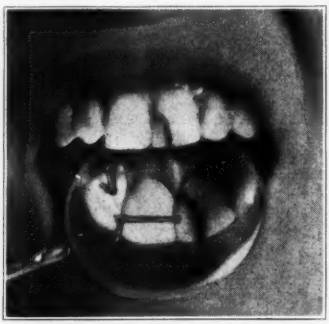

Fig. 9.—Inlay tried in mouth to adjust contact and occlusion and to check shade, margins and lock pin.

inlay if dry. The platinum is left in the tube. The pin or tube rarely casts a shadow that is noticeable. We always cover the margins and outer surfaces with wax before etching the inlay. Hydrofluoric acid applied with a match or toothpick should produce sufficient etching in from one to two minutes. If the inlay is not sufficiently etched in this way, we place the piece of wax containing the invested inlay on water in a plaster bowl or small container. Next, we touch the drop of acid on the inlay with the heated point of a broken instrument. The boiling acid will etch very quickly and thoroughly. We always rinse off the remaining acid in running water. The inlays are not placed in a sodium bicarbonate solution, as this might neutralize the acid of the cement. The inlay is thoroughly washed before setting in the mouth.

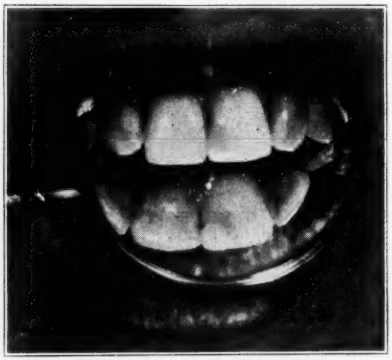

Fig. 10.—Finished inlay; showing polished end of pin flush with inlay.

Fig. 11.—Lock-pin inlay; showing pin and tube.

Setting. — Cements, which will not change the color, or adhesive silicates may be used. I prefer the adhesive silicate, as I get better shading. If cements are used, a silicate may be placed along the labial margin, and thus the line be eliminated. This should be applied at the time that the inlay is set.

The cement or adhesive silicate must be worked well into the pin hole in the tooth as well as the box on the gingival seat. Next we fill the tube and insert the pin as far as the inside surface of the inlay; carry the inlay to place and gently work the pin into the tooth, holding firmly till thoroughly set. Cocoa butter is applied when the inlay is set, and, with a carborundum disk lubricated with cocoa butter, the protruding pin and tube may be removed. (Fig. 6.) The end of the pin may be smoothed with a sandpaper disk well lubricated with cocoa butter in order not to generate heat.

This type of inlay may seem complicated, but I have not experienced any more difficulty with it than with the ordinary proximo-incisal types. In a study of the leverage and stress on these inlays, the placing of the pin at as nearly right angles as possible to the long axis of the tooth seems to give the best retention. Considering the gingival margin as the center of a circle or the fulcrum, the pin point should tend to resist tipping, and by placing the point outside the circle, greater resistance is obtained. (Fig. 4*E*.) The angle of the pin from lingual to labial aspect offers greater resistance also, as the greatest stress is from the lingual. (Fig. 2*H*.) The idea of this inlay was obtained from the gold foil preparation with its three potlegs or retention points. (Fig. 4*F*.) Porcelain adheres to a tube without causing porosity, but in the case of a pin that is baked into the inlay, we find the porcelain full of bubbles next to the pin, which weakens this retention.

SUMMARY

Baked porcelain is the most nearly ideal material that we have for the restoration of human teeth. Its shades, translucency, nonconductivity and imperviousness to moisture fill our needs better than any other material that we have today. The greatest faults that we can find in it are its friability and contraction. We can lessen the dangers of shrinkage and fracture to a great extent by using the simplest preparations and the locked pin retention.

THE MOVEMENT FOR REFORM IN DENTAL DRUGS*

By SAMUEL M. GORDON, Ph.D., Chicago, Ill.

"THE blind faith which some men have in medicines illustrates too often the greatest of all human capacities—the capacity for self-deception," Prof. William Osler remarked in an address in 1909.[1] This statement probably epitomizes one of the reasons that the patent medicine and the proprietary medicine industry is a fertile field for dividend returns. After speaking in general of the basis on which treatment of disease should rest, Dr. Osler went on to point out how credulous and supine the medical profession had become in the matter of prescribing preparations which were based on the therapeutic vagaries of the generation and which were exploited by specious pamphlets sent out by pharmaceutic

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

1. Osler, William: Treatment of Disease, Brit. M. J., 2:185, 1909.

houses, large and small—a reflection, he said, on the members of a free profession who were expected to do their own thinking. His protest against drug exploitation is best put in his own words:

> Let me specify three items in which I think the manufacturing pharmacists have gone beyond their limit and are trading on the credulity of the profession to the great detriment of the public. The length to which organotherapy has extended beyond the legitimate use of certain preparations is a notorious illustration of the ease with which theoretical views place us in a false position. Because thyroid extract cures myxoedema and adrenalin has a powerful action, it has been taken almost for granted that the extract of every organ is a specific against the disease that affects it. This forcing of a scientific position is most hurtful. . . . A second most reprehensible feature is the laudatory character of literature describing the preparations which they manufacture. Foisted upon an innocent practitioner by a learned Autolycus, the preparation is used successfully, say in six cases of amenorrhoea; very soon a report appears in a medical journal and a few weeks later this report is sent broadcast with the auriferous leaflets of the firm. A day or two before I left England a pamphlet came from X & Co., characterized by brazen therapeutic impudence, and indicating a supreme indifference to anything that could be called intelligence on the part of the recipients. That these firms have the audacity to issue such trash indicates the state of thraldom in which they regard us. And I would protest against the usurpation on the part of these men of your functions as teachers. Why, for example, should Y & Co. write as if they were directors of a large genito-urinary clinic instead of manufacturing pharmacists? . . . . What right have Z & Co. to send on a card directions for the treatment of anaemia and dyspepsia, about which subject they know as much as an unborn babe, and, if they stick to their legitimate business, about the same opportunity of getting information? For years the profession has been exploited in this way until the evil has become unbelievable, and we need as active a crusade against pseudo-science in the profession as has been waged of late against the use of quack medicines by the public. We have been altogether too submissive and have gradually allowed those who should be our willing helpers to dictate terms and to play the role of masters. Far too large a section of the treatment of disease is to-day controlled by the big manufacturing pharmacists who have enslaved us in a plausible pseudo-science.

This great physician, who practiced the art and humanity of medicine, had among his other rare qualities the gift of speaking plainly, forcibly and to the point. Osler practiced the art of medicine on the foundation of the science of medicine. Anyone who has not denied himself the pleasure of reading Harvey Cushing's "Life of Osler" cannot fail to see why Osler should express himself as quoted above. His armamentarium of drugs included only about a dozen to cover the whole range of diseases that a physician of that day might encounter in daily practice.

These remarks by so distinguished a teacher reflected in general the conditions in the medical profession when the *Journal of the American Medical Association,* under the leadership of Dr. George H. Simmons, in 1905, opened its war against quackery and the proprietary medicine evil. Osler's remarks can be summarized by Dr. Simmons' phrase, "The commercial domination of therapeutics." A survey of that journal of the past quarter of a century would mirror the basis on which Dr. Osler's general denunciation of those inimical practices were made. When Osler spoke, four years had already passed since the American Medical Association had organized its Council on Pharmacy and Chemistry and begun its work of exposing charlatanism and quackery in medicine. Overnight, the advertising pages of that journal and of many state journals reflected the findings of this group of specialists and scientists. It was the beginning of an

era of comparative decency in the advertising of some medical products.

The year 1909 was also the third year since the passage of the Food and Drugs Act. The Food and Drugs Act is a legal method for combating false statements of curative and therapeutic value on the labels and circulars of medicinal products. Unfortunately, the Food and Drugs Act, while it prevents statements on the circulars and labels accompanying the package, does not prevent an exploiter from saying what he will in other advertising regarding the product. Despite the limitations of the Act, it did much to combat quackery.

Many changes have since taken place. The business and scientific ethics of some houses have greatly improved. Some, which in 1905 were purveyors of "ethical" remedies, have frankly placed their products in the patent medicine class. Some pharmaceutic houses have scientific staffs of high attainment, but such are too few in number and, unfortunately, the advertising and sales departments, not the scientific departments, are strongly represented on boards of directors. As a result of these activities, there are proprietaries today which represent real advances in therapeutics and are honestly advertised.

Now what has this meant to, and what was the effect of these activities on, dentistry? To be sure, the work of the American Medical Association and other bodies was a benefit to dentistry, for many of the drugs useful in medical practice, are useful in dental practice. Moreover, the work of the Council on Pharmacy and Chemistry and the legalization of the Pharmacopeia and the National Formulary acted as levers to raise the standards of pharmaceutic manufacturing in this country and insured that the supply of the really useful drugs, such as procain, epinephrin and anaesthetic gases, would become more and more satisfactory, but this was only part. The proprietary remedy situation was still a grave one. Many nostrums of medicine now became ethical proprietaries in dentistry and were given a false respectability because of the acceptance of their advertising in certain dental journals. Many new ones have grown up since, particularly tablets for preoperative and postoperative pain, mouth washes, etc., put out by many "shoe string" laboratories, the owners of which are not dentists, pharmacists or chemists. A survey of the products advertised by these journals to dentists and some of the literature that still appears is a continual insult to dentistry.

The oral hygiene movement in this country, started about fifteen years ago, brought to light a type of advertising in which dentists were literally slandered by the false claims credited to the dental profession. Every new thought, no matter if unestablished, was seized on by exploiters and broadcast in such a way as to aline the whole profession with them. The old consumption "cures" were now transformed by a turn of the pen to "cures" for pyorrhea, bleeding gums, etc. Glib tongued Autolyci, luringly written literature, promised the newest cure for pyorrhea. While dentists were struggling in an attempt to define the ideal dentifrice, each advertiser had the ideal dentifrice with different claims, although they were all essentially alike. While dentists were quietly seeking the cause and means of cure or alleviation of pyorrhea, many startling nostrums for the sure cure of pyorrhea were foisted on the profession and a long-suffering public by certain manufacturers who asserted their desire to work in the best interests of the profession. It is little

wonder that these men attempted to create a partnership with dentistry for, according to a recent article in *Drug Markets,* a journal devoted to the interests of the proprietary medicine business, the dentist is a valuable pharmaceutic prospect because of the promotional value which he represents in introducing some products to the public.

All dentists, to be sure, had not inured themselves to what appeared to be accepted practices; a few hardy souls dared to protest from time to time.

The protests appear to have gone unheeded until the early years of the last decade. In 1924, action was taken at the annual meeting of the Association, which later was to culminate in the formation of the American Dental Association Bureau of Chemistry, in 1928, and the subsequent formation of the Council on Dental Therapeutics, in 1930. A brief résumé of the activities since then may be of interest.

CONDITIONS FACING THE PROFESSION

When the Association started on this work in 1928, tooth paste advertising had reached the height of chicanery and even outright dishonesty. The public, and even the profession, lost sight of the circumstance that all a dentifrice possibly could be expected to do was to aid in cleaning the surfaces of the teeth. The dentist was frankly puzzled by the frequent question, "Doctor, what dentifrice shall I use?" In most cases, while manufacturers were free with claims, the fundamental knowledge of composition was withheld. Later, when the acceptance of certain tooth pastes was announced by the Council, some dentists wrote expressing wonder as to what magic means were used to obtain the composition.

Tried and true simple pharmacopeial drugs or the well known mixtures were endowed with claims of which their originators could never have dreamed. These were given new and noninforming names and, from their simple usefulness, they were converted by printers' ink into pyorrhea cures. Textbooks, unfortunately, carried references to palpable nostrums.

Meanwhile, dentistry had been extending its sphere of inquiry and treatment. It was coming to consider preventive in addition to reparative measures. Its sincere investigators were emphasizing what was long known: that the oral cavity could not be separated from the rest of human system. They were treading the slow but sure road that could bring light; but the charlatan and the Wallingford saw here also an opportunity, for experience has shown that whenever a new discovery is made in the field of science, commercial exploiters are ready to adapt that discovery for their personal gain. "Shotgun" laxative mixtures were exploited with the story that stomach acidity must be controlled to overcome "acid mouth"; clinical samples of potentially dangerous sedative mixtures, usually "shotgun," were to be "prescribed" under a short and "catchy" name because of the specter of preoperative and postoperative pain, and glandular products of unproven value in dentistry were exploited as capable of doing what Nature was not able to do. Products such as Anacin, Sal Hepatica, Antiphlogistine, X-It, Oxycrystin, Peralga, Odol, Perdentin and Mu-Sol-Dent were urged on dentists with statements which indicated the thraldom into which dentistry had permited itself to fall. Manufacturers discovered the application of biochemistry to the mouth, and "synthetic saliva" was promised as a cure for pyorrhea. Bacteriology furnished a plaything for advertising mathematicians.

Some tooth paste advertisers would have had us believe that the glands needed artificial stimulation. Bottled psychology was rampant.

The more enlightened laity were also aware of the conditions. Imagine the reaction of an intelligent layman as a dentist would hand out a package containing two tablets of Anacin, the claims for which were at one time declared false and fraudulent by the Government. Is it not little wonder that a sales manager of one of the large drug houses could recently say, "Many pharmaceuticals of more or less value have at least received their start to maturity and fame by what in effect is dental profession recommendation, as samples by the thousands have been passed out by the dentists to their patients."

For the dentist to expect a statement of composition was an impertinence. To expect worth-while evidence for some of the claims was not only considered impertinent but also looked on as ungracious by those who would doubt their advertising literature, after they had been so freely supplied with clinical samples.

Such, in general, were the conditions when the Bureau started its work.

THE WORK OF THE BUREAU

When the Bureau entered on its work, it was chartering a new field in dentistry. Except for the occasional reports of the Research Council of the New York Academy of Dentistry, such work was new in dentistry. In October, 1928, the first report of the Bureau appeared, on Mu-Sol-Dent,[2] that mucin solvent that was to do away with tooth pastes. But, interestingly enough, the manufacturers of Mu-Sol-Dent could not resist putting out a tooth paste containing the "active ingredients." Readers will remember that surprise was expressed as to how a dilute solution of trisodium phosphate would "prevent tooth decay, tartar, pyorrhea, trench mouth," etc. It was pointed out by the Bureau that rigidly controlled scientific evidence should be presented before the claims could be acceptable. But three years have passed and the controlled evidence has not yet come to the profession.

There followed at regular intervals reports on those hydrochloric acid tooth bleachers, pyorrhea cures, mouth washes, synthetic saliva, and so on. The reports were based on the chemical examination in the light of which the claims were discussed. The Bureau contended that the dental office was not an experimental laboratory where the resistance of the patient could be tested and flatly demanded from manufacturers that they prove their claims by rigidly controlled tests. "The burden of proof lies, not on the consumer, but on the exploiter," was the theme of the Bureau. When the use of a product was positively harmful, words were not minced. The report on Tartaroff, a hydrochloric acid solution, might have served for a host of others.[3] The only essential difference between one or the other was a protected trade name. The same is true of many simple solutions of salt, borax and baking soda, put up as adjuncts for the treatment of pyorrhea. While the claims were given in abundance, evidence that these were as good as a simple salt solution or plain water was lacking. The reports stressed that these preparations were no different from many well-known formulas. Many of the claims were treated iconoclastically. The time of the profession was too valuable to be wasted in this way. How

2. Mu-Sol-Dent, J.A.D.A., 15:1977 (Oct.) 1928.

3. Ex-Cel Tooth Stain Remover, J. A. D. A., 18:356 (Feb.) 1931.

seriously should one treat the claim that a mixture essentially of salt, chalk and borax was "synthetic saliva," the claims of scientific eminence of an unknown, or the claims of a thousand successful cures when the evidence was lacking.

The work of the Bureau was, after all, in the nature of preliminary skirmishes. Frankly, it was critically destructive, for it was necessary to bring home to the profession how they were being bribed for thirty pieces of silver in the form of clinical samples. The early efforts were constructive in the sense that unhealthy conditions were being uprooted. In the long run, this makes for progress, and the profession expressed its confidence in the work. The time had come for the next step.

THE COUNCIL

All this time, dentists were asking, "Which proprietaries are worthy of my respect?"

It has been estimated that no more than twenty-five drugs would give the dentist a complete pharmaceutic armamentarium for intelligent practice. Some dentists have urged, as Osler urged years before, the desirability of using few drugs but using them well; but continued pressure by mail, by traveling representatives, by clinics, and so on, urging the use of this or that proprietary remedy, made it desirable to set up some system to separate the "wheat from the chaff." It was felt that the time had come to further rationalize the use of drugs in dentistry. It was appreciated that the growing sphere of dental problems required the knowledge of specialists in different branches of science. To this end, there was created, in 1930, the Council on Dental Therapeutics.

One of the large objects of the Council is to protect the public and the profession against fraud, undesirable secrecy, imposition and objectionable claims in advertising of dental medicinal articles.

The membership of the Council is such as to inspire your confidence. Each member is a recognized investigator in his special field.[4]

The members were asked to serve because of their scientific ability and skill in their respective fields. Now, for the first time in the history of dentistry, the profession has available the services of a group of men who possess special qualifications for this task and who stand ready to serve them and through them the public.

The service the Council may render

4. The members of the Council are: Samuel M. Gordon, Ph.D., secretary of the Council, Chicago, Ill.; Paul J. Hanzlik, M.D., vice-chairman of the Council, professor of Pharmacology, Stanford University School of Medicine, San Francisco, Calif.; Thomas J. Hill, D.D.S., professor of clinical oral pathology and therapeutics, Western Reserve University School of Dentistry, Cleveland, Ohio; Percy R. Howe, Sc.D., D.D.S., director of Forsyth Dental Infirmary for Children, Boston, Mass.: Charles N. Johnson, D.D.S., LL.D., Editor of THE JOURNAL, Chicago, Ill. (ex-officio); Milan A. Logan, Ph.D., instructor in biologic chemistry, Harvard Medical School, Boston, Mass.: Arno B. Luckhardt, M.D., Ph.D., professor of physiology, University of Chicago, Chicago, Ill.; John A. Marshall, Ph.D., D.D.S., professor of dental pathology and biochemistry, University of California, College of Dentistry, San Francisco, Calif.; Victor C. Meyers, Ph.D., professor of biochemistry, Western Reserve University, schools of medicine and dentistry, Cleveland, Ohio; John F. Norton, Ph.D., director of the Bureau of Laboratories, Department of Health, Detroit, Mich.; Harry B. Pinney, D.D.S., secretary of the American Dental Association, Chicago, Ill. (ex-officio); U. Garfield Rickert, A.M., D.D.S., professor of materia medica and therapeutics and hygiene, University of Michigan School of Dentistry, Ann Arbor, Mich.; Harold S. Smith, D.D.S., chairman of the Council, Chicago, Ill.

will be limited only by the limits of your support. Each member of the Council, except the secretary, serves without remuneration. Time will not permit me to tell how much is being expected of these busy men, themselves outstanding teachers and investigators, each interested in the activities of his own scientific society, some editors on the staffs of leading scientific journals, other than to say that the reading of the regular Council bulletin, which goes to them every two weeks, is alone a time-consuming task. No mention is made of the time taken in the preparation of reports, in consulting the literature on Council problems and even of carrying on investigative problems for the Council.

One of the aims of the Council will be to furnish to the dental profession a list of proprietary remedies which are honestly advertised and which give some promise of therapeutic merit. In addition, it is actively engaged in compiling a list modeled after that handy little compendium "Useful Drugs," published by the American Medical Association, which has become a standard text in most courses in pharmacology and which has been adopted by most state boards for examination in materia medica and so on, as a guide. In this, the Council is governed by a set of rules.

THE RULES OF THE COUNCIL

It is a truism that needs no debate that the thoughtful practitioner, in treating a diseased condition, attempts to determine the cause and remove it, if possible. To this end, as well as to the prevention of disease, all research in the fields related to dentistry is aimed. It is felt that in a consideration of medicinal preparations, a service can be rendered the profession in pointing out the existing state of knowledge. The profession, too, should be warned, whenever it is necessary, regarding attempts of those exploiters who would make it an advertising medium for preparations of little or no merit.

The rules are ten in number.

Rules 1 and 2, and, in a measure, 5, 7 and 9, deal with the composition of articles. Rule 1 requires that the quantitative composition of an article be furnished for publication. Rule 2 requires that the manufacturer furnish methods whereby the composition of a product, whether a definite chemical compound or a mixture, can be determined. Rules 5, 7 and 9 refer to source, poisonous ingredients and patents of a preparation.

No one will deny that it is not only the right but also the duty of the dentist to know the composition of what he is asked to use, prescribe or recommend; whether it be for a mechanical procedure, a therapeutic purpose or for "oral hygiene." This was long ago admitted in medicine; it is encouraging that general appreciation of it is becoming more and more outspoken in dentistry. When it is considered that many dentists are not any too conversant with the chemistry or pharmacology of drugs, it is not surprising that some were carried away with the claims made for the Sherman L. Davis products. How much respect does a statement of composition of this sort deserve: calcium-phosphorus and parathyroid; or the claim made for the so-called new abrasive in Pepsodent tooth paste, "special calcium phosphate"; or the statement of composition given for Perdentin: alcohol - benzylic - trichlormethanat; etc.? How much is a statement of composition worth that gives only one active ingredient instead of three or four others that may be contained in the product? In the case of many pain relievers composed of acetanilid, acetylsalicylic acid, quinin, caffein, phenolphthalein,

barbital, etc., a more prudent though a still dishonest course is pursued. These give only the amount of acetphenetidin, not from generosity, to be sure, but because the Food and Drug Act requires a statement of the presence of this potentially harmful property. No reference is made to the other drugs, although most of them are potent in themselves. In extolling the virtues of such mixtures, the fact that each of them may bring about an equal therapeutic effect is studiously avoided.

General insistence on Rule 2, that the manufacturer give methods for verifying the claimed composition, would help to guard against many of the so-called ethical proprietaries. For example, there is now before the Council a preparation which represents nothing new beyond another trade name for an official product which has been irrationally modified. A statement of composition that left apparently little to be desired was given. As the composition was decidedly complex and it was evident that no methods were available to determine the components of such a mixture with anywhere near the accuracy implied in the plethora of figures given, the proprietor was requested to furnish methods for determining the composition and further asked if the composition was calculated from the materials used in the mixing. The former he did not do, but the latter was answered in the affirmative. This bore out the remark in an earlier Council report that the statement of composition did not reveal the composition of the material as used by the practitioner, for an oxidizing and a reducing agent were employed in making up the preparation. Almost any schoolboy finishing a first course in chemistry knows that this is a pharmaceutic incompatability. What the material really amounted to was: Vleminckx's solution, listed in the National Formulary for years, irrationally modified and sold under a new name at a fancy price. The advertising gave the impression that here was something new.

It is not necessary to point out that the issuance of a patent for a medicinal product does not always represent a pharmaceutic, chemical or therapeutic advance. Semafor, the wigwag system of oral hygiene, salt solution, was covered by a patent.[5] Dentists do not now take much stock in a claim that such-and-such a dentifrice contains a certain preparation, such as was represented in advertising for Forhan's-for-the-Gums[6] and for Ipana Tooth Paste, which is stated to be compounded with ziratol.[7]

ADVERTISING

Rules 3 and 4 provide against the recognition of products which are advertised to the public directly or indirectly in such a way as to encourage self-medication. Exceptions are made for those products the advertising of which would not encourage self-medication. These exceptions apply to dentifrices and other prophylactic agents about which the public should be informed, provided they are not advertised as curative agents either directly or inferentially. The Council's stand on dentifrices may be of some interest. The Council in a rather lengthy report pointed out the chicanery connected with dentifrice advertising.[6] To bring some order to this field made chaotic by advertisers themselves, the Coun-

5. Semafor, J. A. D. A., 15:2357 (Dec) 1928.

6. Forhan's-for-the-Gums, J. A. D. A., 18:548 (March) 1931.

7. Ziratol, Report of the Council on Pharmacy and Chemistry, Propaganda for Reform, of the American Medical Association, 2:149, 1922.

cil agreed to reward fairness by agreeing to admit dentifrices to Accepted Dental Remedies provided the claims were limited solely to their cleansing properties. That this stand is liberal may be gaged by the fact that evidence on the relative cleansing powers of dentifrices is conspicuous by its absence, not to mention possible scratching or abrasive agents that may be present. The liberal acceptance of dentifrices as with other products does not imply a recommendation. In time, the acceptance of even this class of products will have to be justified by scientific evidence. Manufacturers should show that use of a dentifrice is more beneficial than use of a toothbrush alone, which is stated by many to be the important factor in tooth cleaning.

The Council cannot accept pain relievers of the Anacin, Aspirin, Sed-A-Rex and Aspergum type because of the potentialities for self-medication. A rigid application of Rule 4 by the profession will protect the practitioner against becoming a party to advertising these preparations in his office. The busy practitioner is apt not to appreciate that his recommendation has a tangible financial value. In commenting on the vast earnings of Listerine,[8] a sales manager of one of the better pharmaceutic houses was led to comment that much of the total is the result of recommendations of dentists for what has long been frankly regarded as a nostrum. Dentists are beginning to appreciate how they have been "worked" in unwittingly helping to increase the sales for mouth washes, tooth pastes and pocket-size packages that carry a threat of possible harmfulness. When a doctor hands out two tablets in a little white envelop with a short "catchy" name printed prominently across it, he little appreciates what consequences it may have. Were he aware of the circumstance that some years ago the Government published a report calling attention to the harmful effects of acetanilid, antipyrin and acetphenetidin, and the marked increase in the number of cases of poisoning and fatality and instances of habitual use of these drugs, the possibility is that he would frown on accepting these clinical samples.[9] When the dentist can purchase at relatively little cost in thousand tablet lots such simple analgesics as acetphenetidin, acetylsalicylic acid or amidopyrin, the principal constituents of these pain relievers, and give enough for the prescribed number of doses, why should they enrich certain manufacturers at the expense of professional prestige, and why should dental journals and state societies admit these products to their advertising pages and annual exhibits? It is encouraging to note that as products of this class are being brought to the attention of dentists in charge of exhibits, they are refusing to sell space for them.

THERAPEUTIC CLAIMS

Rule 6 makes ineligible for inclusion in Accepted Dental Remedies any product for which the manufacturer makes unwarranted or exaggerated therapeutic claims. Therapeutic exaggeration appears to be a common failing; a failing probably arising from lack of discussion of what appears to be accurate and dependable clinical evidence. Unfortunately, many accept impressions as accurate clinical evidence. Yet everyone can agree, in principle at least, that, to be acceptable, clinical evidence must offer objective data with such citation of sources as will enable the dentist and other unbiased observers to confirm the facts and

8. Listerine, J. A. M. A., 96:1303 (April 18) 1931.

9. U. S. Dept. of Agriculture Bull. No. 126, July 3, 1909.

establish the scientific basis of conclusions drawn. Claims contrary to the accepted data of science need strong evidence to make them acceptable, while little is needed for acceptance of well-established data.

In view of the common acceptance of individual impressions as evidence, it is often embarrassing to the Council to declare as incompetent the statement of some well-meaning and kind hearted doctor. The Council had to take this position for some of the evidence considered in the case of some "mouth washes" submitted as curative of pyorrhea. Then, there is the type of evidence exemplified by the dentist who, unfortunately, permitted his name to go in print as endorsing a product containing pumice and soap, as a remedy for pyorrhea and the conditions usually associated with it in advertising.[10] It is gratifying to note that, as reports of the Council on various products are brought before the profession, they are coming to appreciate the gulf between claims and evidence. They will no longer look for cure-alls, as indicated in a recent letter:

> I find in giving my table clinic that it is necessary to combat all the time that desire on the part of many to find a "cure-all." All many of them apparently want to know is, "What mouth wash can I use?" After the .....meeting, where I talked all afternoon on the principles of treatment (for Vincent's infection), several letters came asking that very thing. Applied medicine is not a mechanical procedure.

The desire to find a "cure-all" will pass as it becomes commonly known that the profession seeks a system of therapeutics which acts in definite terms of the remedy and conforms to the operation of well-regulated biologic phenomena as far as possible. The converse of this is guesswork and ignorance.[11] This system is developing as the pitfalls of haphazard clinical trials become better known and the dentist's mistrust of glowing accounts of marvelous cures are more outspoken. This honest skepticism will lead to a return to the few tried and true preparations that are the common property of all and will lead to a happy nihilism, where drugs are not indicated.

10. Lavita, J. A. D. A., 17:175 (January) 1930.

NOMENCLATURE

The composition and therapeutic claims and accomplishment in the clinic determine in large measure the usefulness of a drug. It cannot be too often repeated that the only originality in many proprietary remedies is a new name. Witness the plethora of names for hydrochloric acid tooth bleachers, for pain relievers, for pyorrhea cures made up of zinc chlorid or chromic acid, for the numerous proprietary drug treatments for Vincent's infection. If a law were enacted to oblige manufacturers to sell medicinal products under a properly descriptive name or to make it illegal for a physician or dentist to use or prescribe them, the use of most proprietary remedies would be discontinued and successful newcomers might each year be counted on the fingers of one hand. What originality in composition was there to many of the products already reported on? What originality is there entitling the proprietor to a protected name for the many brands of sodium perborate? Why should its exploiters be enriched when a product could be purchased under its own name, in-

11. For an interesting discussion on some phases of clinical evidence, see "Scientific and Rational Therapeutics; Its Effect on Dental Progress" by P. J. Hanzlik, Jour. Amer. Dental Association, 18:626 (April) 1931, and "The Crucial Test of Therapeutic Evidence" by T. Sollmann, Jour. Amer. Medical Association, 69:198 (July 21) 1917.

stead of under another name and at a premium? It would be a long step forward if the dentist would recognize more fully the objections to the many proprietaries, either old drugs or a mixture of well-known drugs, which have as their only originality a nondescriptive name. Encouragement of them clutters up the simple drug cabinet of the dentist. In the case of irrational articles (i. e., products containing more than one active ingredient), the Council will place the burden of proof not on the profession but on the exploiter. He will have to establish the rationality of a mixture if he can. This is said advisedly because many of those in the dental proprietary business are no more competent to advise dentists about them than they are to practice dentistry.

Experience has taught that testimonials can be had for them, but they contain no evidence that the mixture is superior to or as good as its potent ingredient.

All in all, the Rules furnish the dentist a satisfactory definition of what may be considered an ethical remedy. The standards cannot be too high. A strict application of the Rules by dentists will lead to a materia medica consistent with the development of dentistry. The dental teacher can help by giving the dental student of tomorrow a thorough practical knowledge of the great drugs and their place in the treatment of dental disease. This will result in sending out independent, clear-headed, cautious practitioners, who will do their own thinking and be no longer at the mercy of a meretricious literature.

Feeling confident that their efforts will meet with the approval of the profession, the Bureau and Council will, as time goes on, examine more preparations and study more critically the evidence regarding pharmaceutic mixtures sold to you and your patients. Your success will be the Council's success.

THE PEDIATRICIAN'S VIEWS ON DISORDERS OF THE TEETH*

By ISAAC A. ABT, M.D., Chicago, Ill.

THE physician who is called upon to treat the diseases of infancy and childhood is particularly interested in disorders of the teeth. Frequently, these defects are first observed by the pediatrician. He is not only interested in these individual structures, but his inquiries are also directed to the *reciprocal* relationship between the general health of the patient and the dental organs.

The cause and alleviation of dental disorders require the intensive study of pediatricians and dentists alike. As we proceed, we shall learn that dental disease, as far as we can ascertain, does not have a single cause, but is made up of a number of factors, the local expression of a nutritional, infectious or constitutional anomaly. Not only the pediatrician, but also the dentist is interested in those biologic problems, local as well as constitutional, which assist in solving the problems of prophylaxis of dental diseases.

*Read before the Section on Mouth Hygiene at the Midwinter Clinic of the Chicago Dental Society, Jan. 19, 1932.

It is gratifying to note that the profession of dentistry is thinking along the lines of progress in medical science as a whole. The fundamental branches of medicine, including anatomy, physiology and pathology, are as important to one branch of medicine as to another. The field of medical practice is so extensive that we must of necessity divide ourselves into groups and devote ourselves to definite fields, although, according to natural law, we cannot separate one organ or group of organs from the rest. Each is a part of the whole and they are interdependent. Disease of one tissue or organ may ultimately exert its influence on the entire organism. It may be said to the credit of the dental profession that it is not losing sight of the advances which are being made in general medicine. If one scans the literature, he will find that dentists are making original investigations in their particular branch. A persistence of this investigative spirit will ultimately result in the solution of many problems and, by extending the boundaries of knowledge, we will be led to a better understanding of fundamental facts and more satisfactory methods in the prophylaxis and treatment of dental disease.

ANTHROPOLOGY IN RELATION TO DEVELOPMENT OF TEETH

Anthropologic studies which inquire into the structure and diseases of teeth among primitive races should aid us in determining whether the habits and modes of life of civilized man have caused more destructive diseases of the teeth in modern times.

In his comparative studies on the dental apparatus of Englishmen of today, as compared with the British people of the Neolithic and early Bronze period, Sir Arthur Keith found that misplacements of the teeth, long narrow dental arches, high vaulted palates and carious teeth, which are so prevalent today, were almost unknown in prehistoric and primitive times. Pathologic conditions became more frequent during the Roman period, although they are rarely found in the remains from the Saxon graveyards.

In the eighteenth century, when industrialism was introduced into English life, the various dental disorders became most common. Keith studied fifty early medieval and fifty modern English skulls. He found, among the former, definite abnormal changes affecting the teeth, jaws, noses, orbits, cheeks and other structures of the face. In the modern skulls, the teeth tend to overlap. There is frequently a narrowing or contraction of the palate. Twenty-five Englishmen out of every hundred will show, at the present time, a gross disturbance in the growth of the palate or in the eruption of the teeth. It is to be noted that contracted and irregularly developed palates are never seen in early medieval skeletons. While dental abscesses were nearly as common in early times, carious teeth were three times as frequent in modern as in early skulls.

In modern civilization, the jaw seems to be diminishing in size and the teeth are crowded, and it has been assumed that dental caries may be due, in part at least, to this overcrowding. The teeth themselves tend to diminish in size during the process of evolution. This is most readily observed in the third molar, which is largest in the gorilla, but in man has come to be the smallest of the molars. Sometimes the third molars fail to appear altogether, or they may arrive late in life. Degeneration of the wisdom teeth is evidenced by the fact that they tend to decay early, diminish in size and lack vitality.

HEREDITY

The influence which heredity exerts upon the structure, the quality and the durability of the teeth as well as their alinement and the formation of the jaws, cannot be definitely stated. Familial resemblances and hereditary characteristics are so frequently observed throughout the organic world that we must not underestimate their significance, though their study and explanation should attract the thoughtful attention of scientists. It is apparent that, at present, the data at hand are insufficient for postulating dogmatic statements. To quote Balzac: "Heredity is a sort of maze in which science loses itself."

There are those who maintain that the size and shape of the head and jaws, contour and mold of the body and all characteristic qualities of form and structure are transmitted from generation to generation. The abnormalities of jaws and teeth may depend in no less degree on hereditary transmission.

We learn from embryologic studies that the starting point of sexual development is the egg, which is a single cell; whereas, the adult animal, arising from this particle of protoplasm, is composed of countless cells. It is obvious that this enormous cell multiplication is necessary, and during this developmental period, two other important facts are to be considered, namely, growth and cell differentiation.

The primitive cell, the fertilized ovum, is differentiated into tissues and organs whose characters and qualities should not be dissimilar to the cellular material from which they originate.

On account of the unsatisfactory state of our knowledge on this subject, there are those who would deny for the most part the influence of heredity on the structure, quality and position of the teeth, as well as the formation of the jaw. Dewey, in his "Practical Orthodontia," states that, from the standpoint of biology, anatomy, histology and embryology, there is no evidence that malocclusion is ever inherited.

In regard to the subject of heredity as it affects animal structures and abnormalities, we are reminded of the dilemma of William Harvey (the discoverer of circulation, 1578-1657), who found himself bewildered by the baffling problem of embryologic development. He recognized that the fetus originated from the union of the male and female and that the chicken came out of the egg, yet, he said, "Neither the schools of physicians, nor Aristotle's discerning brain, have disclosed the manner how the cock and its seed doth mint and coine the chicken out of the egg." We seem to be much in the same position today. We surmise, and many intuitively believe, that the progeny inherits physical and mental traits, normalities and abnormalities not excluded, though adequate proof for this assumption is for the most part wanting.

Forel, the Swiss psychiatrist, is strongly of the belief that alcoholic intoxication of either parent during conception may lead to mental or physical abnormalities in the progeny. Stockard's experiments will be recalled in this connection. He showed that an injury to the germ cell may express its effect on the offspring. He accomplished this injury by administering alcohol to pregnant guinea-pigs. He believed that, by his experimental method, he was able to produce diseased or altered chromosomes in the germ cell.

There is considerable evidence that harelip and cleft palate are hereditary defects, not only in man but also in dogs. Similarly, defects of teeth and jaws seem to be inherited, though sufficient data

have not been collected for accurate analysis. Pfaff was able to demonstrate a hereditary factor in anomalies of the jaw over a period of several generations. He found fifty persons affected in this manner.

Stehr believed that most of the dental irregularities, including the V-shaped jaws and other varieties of deformity in these bones, are due to arrest of development in the intermaxillary bone. He found, in the first stage of this process, a narrowing in the arch of the upper maxilla, then a progressive narrowing, and later on abnormality in the development of the teeth. He also believed that, in children of sick parents, he was able to demonstrate the narrowing of the upper arch in the first child, and increasing deformity in children of subsequent birth. Confirming the observations of Forel, Stockard and others, Stehr believed that alcoholism in the parents may produce dental abnormalities and malformations of the jaw in the progeny. He was able to follow up the children of several generations and believed that heredity is an important factor in the determination of dental and maxillary anomalies of the severest grade, and also accounted for variation in the size and shape of jaws and teeth.

It has also been thought that the abnormal position of the incisor teeth may be a familial characteristic. A case is reported in which three brothers inherited the small jaw of their mother and the large teeth of their father, and all of the children showed similar anomalies of dental distribution. Dental anomalies, such as abnormal spacing between the teeth, open-bite and deep-bite, have been seen in several generations and are considered to be family characteristics of hereditary origin.

While the lower arch is generally smaller than the upper one, its form varies according to race and individual type, and familial characteristics seem to dominate the size and shape of the upper as well as the lower jaw.

G. Korkhaus[1] studied dentition in 100 twins. In a large percentage of cases, the mothers reported that the first tooth appeared on the same day in both twins. This occurred usually in homologous twins. The same applied to the second dentition. From his study of dentition in the twins, the author felt that the hereditary factor was of the utmost importance in determining the arrangement and distribution of the dentition. Henry Buchard, in his "Dental Pathology," quotes Hopewell-Smith, who reported the entire absence of crowns occurring in the upper and lower teeth for four generations in the same family. He thinks that the condition is due to hereditary agenesia of the crowns.

In some families, children are born without teeth. In others, they are born with faulty enamel, probably because there is some condition of hereditary character that prevents the development of the tooth germ. Thodariu reports a community in India in which a toothless type of man occurs. The defect appears only in males, though it is transmitted by the female descendants of the affected family.

Weech reports a case of hereditary ectodermal dysplasia.[2] He describes two patients both of whom exhibited multiple congenital anomalies of tissues arising principally from the ectoderm. Both patients showed defective development of the hair and teeth, unusual conformation of the skull and thick, prominent

1. Korkhaus, G.: Vierteljahrsschr. f. Zahnhlk., 45:414, 1929.
2. Weech, A. A.: Am. J. Dis. Child., 37:766 (April) 1929.

lips. The teeth in these cases are markedly decreased in number, and the lower jaw is more likely to be edentulous than the upper. When teeth are present, the incisors are usually of abnormal configuration. In Weech's case, the incisors were cone-shaped. The molar teeth were usually normal in form. It is to be emphasized that, in both cases, histories were obtained indicating that heredity seemed to be a factor in the origin of the anomalies. In addition to the findings already mentioned, the first patient presented a smooth, dry glossy skin with apparent total absence of sweat and sebaceous glands, and malformation of the nose. These lesions were absent in the second patient, though he showed malformed nails.

From these isolated case reports and from the review of the literature, one is inclined to feel that the congenital factor in dental defects and abnormalities of the jaw is not negligible and that, in certain cases at least, heredity may play an important rôle.

DENTAL DEFECTS IN RELATION TO NUTRITION

Perhaps no department of medicine has received more attention or actively engaged more competent and enthusiastic investigators, during the last two decades, than has the subject of nutrition. Much knowledge and many new facts have been accumulated. On the very topic under discussion, namely, the influence of diet on dentition, we find that there is still controversy and divergence of opinion. Hess[3] finds himself at sea concerning the relationship between nutrition and dental caries. It is, he says, very questionable that dental caries is a specific nutritional disorder; and, if it is, which he does not believe, he thinks that the specific cause has not yet been discovered. He has met with numerous instances of nutritional disorders which did not induce caries. He further says that it is the general experience of physicians and laymen that carious teeth are to be found in children of the well-to-do who have had a liberal diet and who never suffered from rickets. He does admit that children who have been protected from rickets develop less caries than children who have not been so protected.

This view is contrary to that which has been held by most investigators. It has been thought that dental caries was largely an expression of faulty nutrition and disorders of metabolism. The majority of investigators have held that the proper quantity of vitamins A, or C or D was necessary in the prophylaxis of caries, and for the normal eruption and evolution of the teeth.

Most of the evidence which has been offered on this point is the result of laboratory experimentation on small mammals. In order that our knowledge may be extended on this point, it is obvious that the laboratory evidence should be confirmed by accurate and extensive clinical investigation and corroboration.

C. E. Bloch[4] is in agreement with Hess's view. Bloch believes that the increasing frequency of dental caries is not dependent so much on diet and hygiene as it is on defects in development and in the structure of the teeth. He holds the same uncertain view as to the relationship of vitamins to caries. He maintains that during the period when the teeth are formed, severe and protracted disturbances of the mineral metabolism produce defective calcification, mani-

3. Hess, A. F., and Abramson, Harold: D. Cosmos, 73:849 (Sept.) 1931.

4. Bloch, C. E.: Am. J. Dis. Child., 42: 273-278 (Aug.) 1931.

fested by defects and hypoplasia in the enamel and dentin. The abnormal metabolism, Bloch maintains, may be due to a lowered absorption of salt, a hypofunction of the parathyroid gland or to a defective absorption of light energy with the implication of a diminished amount of vitamin D.

Not only defects in mineral metabolism brought about by rickets and tetany, but also any protracted disease during the formative period of tooth production may give rise to permanent defects of the teeth. This is observed in the deformities of teeth in congenital syphilis, i. e., Hutchinson's teeth. Furthermore, Bloch believes that vitamin A, B or C deficiency cannot be definitely established as a factor in the production of caries. He reviews the work of the principal investigators and concludes that their results are inadequate to prove that an insufficiency of vitamins is definitely responsible for dental caries. While Westin thought that vitamin C deficiency was the main cause of dental caries in man, he granted that he had not found any case in the guinea-pig, ape or man in which scurvy had been a determining factor in the development of tooth decay. In the same way, he reviews the relationship of vitamin A to caries, and he concludes that deficiency of vitamin A has no specific injurious effect on the formation and calcification of the teeth. Bloch is of the opinion that dental caries in childhood depends on a disturbance of the mineral metabolism. His studies show that severe vitamin A deficiency leads to xerophthalmia, and the mortality among these patients is high, scarcely two-thirds of them reaching the eighth year of life. In this group of patients, caries and abnormalities of the teeth are no more frequent than in unaffected children. Advanced keratomalacia nearly always leads to impaired vision or blindness, though in other respects the surviving children may develop normally.

The results of Bloch's work will come as a shock to investigators and nutritionists who have found in vitamin deficiency the all-inclusive explanation of dental defects; but the final word has not been spoken. It is permissible to assume that the process of nature which governs dental caries is not a simple subtraction of vitamins, causing the teeth to crumble and decay. It certainly is more complex than this. Such a pathologic condition necessarily implies defective mineral metabolism, possibly congenital or acquired defects in the structure of the components of the tooth, and, finally, constitutional disorders affecting the growth and development of the dental apparatus.

ENDOCRINES

So much is attributed to the endocrine glands, while our actual knowledge on this subject, though increasing, is still limited. We are tempted to draw inferences and analogies, nevertheless generalizations, unless based on a large series of observations, must be inconclusive and unconvincing. The experimental side has contributed most valuable information, though even here the evidence is frequently conflicting and consequently not enduring. There are some clinical facts which stand out and seem uncontroverted. In deficiency of the thyroid gland, producing the condition of cretinism, a delayed development of the entire osseous system occurs, causing diminutive stature. Kranz studied the dental condition in cretins and found abnormalities in both dental and jaw conformation of frequent occurrence. He found that defective development of the teeth was frequently observed. Delayed

evolution and caries were almost universally present. The cretins commonly showed horizontal ridges or defects similar to those seen in hypoplasia of the teeth which occurs in spasmophilia. Rabbits and pigs which have been deprived of their thyroid by operative measures showed the structural defects of the teeth enumerated, though no great maldevelopment of the maxillae.

It is a matter of my own observation that hypothyroidism delays the eruption of the deciduous teeth, even as late as the third year, and, in extreme cases, the permanent set may not appear until the tenth year. In other cretins, the teeth may be deficient in number; also, the teeth of the first and second dentition may coexist for a long time, even into the third decade.

The bony tissue is of the greatest interest and importance in dental pathology. Bone reacts to many conditions and agencies, and it is possible that the changes which occur may extend over a long period and be late in manifesting themselves. The chemical processes going on in the body have an important function in the development of teeth and jaws. For an adequate supply of the required lime salts, it is essential that the parathyroid gland be functionally active and normal. It has been shown by numerous investigators that calcium metabolism depends on the integrity of the parathyroid gland.

Erdheim, Peters and others have demonstrated that lamellar cataract not infrequently occurred during the course of tetany, due to calcium deficiency, and Erdheim succeeded in producing tetany and cataract by performing parathyroidectomy in rats. The same author studied the relation of tooth disturbances to the parathyroid gland. He extirpated the gland, and noticed in one and one-half or two months after operation that opaque spots appeared on the anterior surface of the incisor teeth, which gradually spread over the enamel surface. He found that the tooth may break off in the alveolus. No changes as a rule were noted in the dentin. It was pointed out very shortly that these defects in growth and development which Erdheim had observed were associated with tetany and not with rickets, as had been previously supposed. When one considers the frequency of rickets, and the infrequent association of this disease with hypoplasia of the teeth, the conviction grows that not rickets but tetany causes the hypoplasia. The enamel defects are observed in teeth which erupt at about the same period and the areas of erosion arrange themselves symmetrically.

The permanent teeth are more frequently affected than the deciduous. The defect consists of a funnel or cup-shaped depression, which may be arranged in rows on the enamel surface; or there may be folds or furrows in the enamel around the crowns of the teeth. Sometimes, the surface of the enamel is so much involved that the teeth have a honey-combed appearance. Tetany in infants frequently occurs about the time that tooth formation is in full swing, and also at that period of life when the enamel is at its highest period of development.

It is believed that tetany or spasmophilia produces enamel erosion or hypoplasia because of deficient blood calcium or a defect in calcium metabolism. The function of the parathyroid glands in the production of hypoplasia of teeth and lamellar cataract probably depends on the regulatory effect of this gland on calcium metabolism, and in the case of tetany or spasmophilia, on the dysfunction of this gland. In rickets, one finds alterations in

the dentin; in tetany, always hypoplasia of the enamel, leading to the formation of horizontal furrows which persist in the permanent teeth. As a clinical fact, it should be noted that tetany is frequently associated with rickets in the same patient, and it may also be associated with softening of the bone, the so-called osteomalacia.

CONCLUSION

A review of the relationship between pediatrics and dentistry seems to indicate that while the mutual interests of these two departments of medicine have come to recognize their interdependence, many problems are still unsolved, demanding continued study, more thoughtful consideration and further investigation.

Dental disorders, like other disease processes, cannot be successfully prevented until a fuller knowledge is acquired of their cause and nature. We must await the time when the methods of prophylaxis shall be based on accurate etiologic data, obtained by rational observation and experiment.

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MECHANOTHERAPY IN PERIODONTOCLASIA

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WITH the sentiments expressed in an editorial[1] published in THE JOURNAL in October, 1931, I find myself in agreement, i. e., I believe that those who would treat periodontoclasia must ultimately conclude that, regardless of the etiology, the treatment is doomed to failure if it is confined to any one of the following practices: to pyorrhea surgery, to instrumentation, to gum massage, to the reduction of bacteria by chemical or mechanical means, to correction of diet or of systemic conditions or the elimination of poor dentistry or traumatic occlusion. In making a diagnosis and outlining treatment, one must, therefore, give due consideration to each of the foregoing.

To recognize pathologic processes and mechanical deficiencies in and around the teeth requires a knowledge and understanding of the design, function and special characteristics of the machinery of mastication in a state of health and mechanical perfection.

In the human dentition of thirty-two teeth, there are more than eighty cusps, several hundred convex and concave sloping surfaces on the occlusal surfaces alone, several hundred developmental and supplemental grooves and spillways and more than 100 embrasures, lingual, buccal, occlusal and gingival. These and other characteristic features are the same in all human teeth and have been throughout the ages. Each has a very definite function to perform. Nature did not create them without purpose and an object of service. The service each of these characteristic features renders is necessary to mouth health throughout life. It is for us to recognize Nature's scheme of design and apply it to every dental operation.

*Read before the Milwaukee County Dental Society, Oct. 29, 1931.

1. The Question of Pyorrhea Alveolaris, editorial, J. A. D. A., 18:2001 (Oct.) 1931.

The more nearly we approach the ideal in our dental restorations, the more nearly will the teeth and tissues remain in a state of health. Conservation of teeth, perpetuation of tissue health and the advancement of preventive dentistry will be determined to a large extent by the progress made in reproducing precisely the anatomic tooth form and function indicated for the teeth to be repaired or replaced.

The intermaxillary relationship in most cases of periodontoclasia is usually so imperfect that it is necessary to resort to a full mouth reconstruction or occlusal equilibration by grinding the natural teeth.

It is often difficult to decide which method it is better to employ. Each has its redeeming features and each its drawbacks. The method chosen depends on the amount of vertical dimension lost, the degree of deformity, the condition of the bone around the remaining teeth, the prognosis and the patient's ability to face the financial problem involved. There is a very definite need for each type of service. Experience and judgment will determine the procedure best suited to the case. This paper will be confined to the matter of occlusal equilibration and attendant features.

In the majority of cases of periodontoclasia requiring occlusal equilibration for relief of traumatic occlusion, results are better if it is found unnecessary to resort to full mouth reconstruction. Adding length to teeth already handicapped from loss of bony support increases the leverage of that part of the tooth projecting from the bone and, in so many cases, makes for unfavorable periodontal conditions despite a balanced occlusion. The degree of harm depends principally, of course, on the amount of bone lost, the length added to the tooth and the intercusp relationship of the occlusion. In a full-mouth reconstruction, it is necessary to supplant with very hard metal all of the vital points of anatomic tooth form on a new plane of occlusion. This in itself is a most intricate and hazardous task, one which challenges the operator to interpret and duplicate one of Nature's best efforts in mechanical design.

Many a successful full mouth restoration has been made in the past, including that of my own mouth, which has functioned with great satisfaction for more than seven years.

We need not be certain that traumatic occlusion causes periodontoclasia or argue that it is the result of periodontoclasia in order to justify its correction in the treatment of these cases. Success never came to the periodontist until traumatic occlusion took its place among the necessary procedures of treatment.

It is generally recognized that most persons do not possess upper and lower teeth that work harmoniously in all ranges of occlusal movement, even with a full complement of teeth. A few teeth bear the brunt of occlusal stress as soon as the mandible moves away from centric occlusion. Shock and mobility are noted by digital examination when teeth are occluded in various ranges, as well as disturbing changes in the contiguous tissues. The constant injury thus conveyed to the gingival tissue cells lowers their tone and resistance, inviting the invasion of bacteria.

Occlusal equilibration by natural wear on teeth saves many mouths from periodontoclasia. Unfortunately, natural wear does not always progress symmetrically. The amount of wear is an extremely variable factor. In any group of persons of 40 years of age, for instance, one may find teeth with practically no wear at all or teeth fairly flattened from excessive

wear. Teeth out of alinement or somewhat deformed take excessive wear and often loosen as a result of constant stress.

Most wear on teeth takes place when food is being finely triturated or when the mouth is empty. A habit of grinding the teeth unconsciously, day and night, produces a great deal of wear, particularly on the posterior teeth, while the cuspids are worn off when the mandible is reaching laterally in prehensile movement when no other teeth are in contact posteriorly. It is also under these circumstances that the most damage is done to the periodontium by occlusal trauma. Little trauma results to the periodontium when a bolus of food keeps the teeth apart.

While wear may save some teeth from periodontoclasia, excessive wear may be injurious because of the increased force required to crush food with flattened surfaces, and, too, the loss of the grooves and spillways by wear is a constant menace to the underlying tissue.

In a paper read before the Chicago Dental Society last winter, Paul R. Stillman, said:

> As regards natural wear, it is necessary to call attention to the fact that this wear may be entirely absent in cases of extreme functional disharmony, or it may take place in an abnormal manner, due to interference with normal mandibular movements which are all too common in the people of today, and thus produce a deformity of the teeth. Evidence of wear alone is not to be taken, then, as an indication that Nature is carrying out its purpose in a satisfactory manner. Every case must be examined with the utmost care to determine whether there is freedom of mandibular movement in those excursions which are required for the functions of incision and mastication of food.
>
> It is in such cases as these that remodeling of the teeth to permit free movement of the mandible is required. This need not be done until it is clear that it is beyond the power of Nature to perform this liberation of the occlusion. But as soon as evidence of this incapacity is discovered the dentist owes it to the patient to perform the act for him regardless of whether disease is present at the time or not. For it is through free functional use that all health and symmetry of form is maintained.

It is the belief of many dentists that remodeling teeth, as referred to by Dr. Stillman, requires considerable loss of tooth structure, with consequent closing of the bite. This erroneous conception has caused undue criticism of the practice of equilibrating natural teeth. It is true that injudicious and unintelligent grinding may produce all that the most skeptical may fear. Certainly no remodeling should be done where reconstruction is indicated nor in the case of old persons whose teeth have been flattened by wear with no periodontoclasia present.

In the following paragraphs will be outlined the general procedure of "grinding in" an occlusion and remodeling and rejuvenating the teeth to establish proper tooth form function and to institute the mechanotherapy involved in periodontoclasia. The suggestions apply to all types of restorative work and to natural teeth requiring this sort of service. Bear in mind that it is the intelligent selection of cases that makes the application of any procedure worth while. Many cases therefore require full mouth reconstruction and even orthodontia, while others require remodeling, rejuvenating and balancing of the natural teeth. It is this latter type of case that we shall now consider.

The centric relation of the upper and lower teeth often leads us to believe that the patient has an excellent "bite." In fact, most restorative work has been so placed as to fit into the scheme of centric relation only. Little or no attention is paid to the function of the restorative work in the working ranges. Bridges built by the dental laboratory are usually

made on a hinge articulator for one side of the mouth only and partial dentures are made with no thought of performance in lateral ranges.

The usual case requiring periodontal treatment may have an excellent centric occlusion, but the lateral range shows the cuspids end-to-end with no contact between the upper and lower bicuspids and molars. The space between the upper and lower posterior teeth depends on the overbite and overjet of the anterior teeth.

In this type of case, when it is found unnecessary to carry out a full mouth reconstruction, it is advisable to grind the cuspids, and other anterior teeth which occasionally interfere also, so that the upper and lower posterior teeth occlude in the lateral ranges. The grinding of the anterior teeth is confined largely to the upper teeth, in order not to cause a disocclusion in the centric relation. To disocclude any teeth in centric occlusion simply means that the teeth will extrude and come in contact again. There is an exception to this occasionally in lower anterior teeth that have never touched the upper anterior teeth owing to a locked position that they seem to have in relation to neighboring teeth. Another exception may be cited where contact between upper and lower bridges in certain spots may keep the teeth from extruding. The grinding of the posterior teeth should be confined to the overlapping cusps, which are not concerned in centric occlusion; that is, the buccal cusps of the upper and lingual cusps of the lower teeth. In this manner, the grinding brings the occlusal plane to conform more accurately to the ideal curvature of a sphere.

After the anterior teeth are relieved sufficiently to bring the posterior teeth into or near occlusion in the lateral range, it is often found that the buccal cusps of the posterior teeth are not all in contact and the balancing side is not in contact. It is then necessary to relieve the interfering teeth so that the maximum occlusal contact in the working range is obtained. Sometimes, deepening and widening the buccal developmental grooves will accomplish the desired result. These are often obliterated by wear, malformed to begin with or, it may be, overstuffed with filling material. If cusps are to be ground, it is best to relieve the upper buccal cusps, but often it is necessary to reshape the buccal surface of the lower cusps.

The results of any grinding thus indicated should conform as nearly as possible to anatomic tooth form. Certainly, no flat inclined planes should be left.

When the working side has been ground in, it will invariably be found that the opposite or balancing side automatically comes in occlusal contact, and thus a functional balance is established.

The balancing side may be striking too hard before the working side is completed, and it is then usually necessary to reduce the interfering points. This likewise may be accomplished by enlarging grooves to accept opposing cusps or narrowing opposing cusps, at all times guarding against grinding that will disocclude teeth in centric occlusion.

When the posterior teeth have been made to function for the full width of their occlusal surfaces, their efficiency as units in the masticating machine has increased to a point of perfection. Stimulation of the underlying tissues is increased by the more normal function of the teeth benefited, and teeth once overloaded are relieved of excessive stress.

The anterior teeth now functioning without interference in the lateral ranges are made to function as nearly normally as possible in the protrusive range and in the combination of the protrusive and

lateral ranges. It is desirable that the posterior teeth occlude when the anterior are end to end. This is often possible; but where too much grinding would be necessary, it is advisable to obtain the maximum amount of contact possible. With very little grinding, the twelve anterior teeth may thus often be brought into perfect relationship, continuing from centric occlusion out to an end-to-end relationship.

Anatomic tooth form must be adhered to for esthetic as well as functional reasons. Usually, the appearance of the anterior teeth is improved by remodeling because of previous unsymmetrical wear or because of irregular outline.

The lower anterior teeth should not be ground out of centric occlusion, but may be relieved if they are striking the lingual aspect of the upper too hard. Reshaping may be done on them without disturbing this relationship. Grinding of the anterior teeth to any appreciable degree is usually done on the overlapping upper teeth. Aside from the grinding that is done on the cuspids in many of these cases, it is surprising how little grinding it takes to establish a functional balance.

The task of balancing an occlusion in this manner is an intricate and delicate one. While the general procedure may be outlined, the intricacies that are present in each case defy complete description for purposes of explanation of procedure.

It is impossible to grind in a case so well in a few visits that no further attention is necessary. These cases should be examined at intervals of every few weeks at first, then every few months, until it is no longer necessary to keep them under close observation. Changing the direction of force and function on a tooth may alter its position slightly and the occlusion will again require adjustment. One is liable during the first few visits of the patient to overlook many of the hundreds of important minute points that must coordinate one with the other in making up this complex machinery. Balancing an occlusion, in any manner requires a very definite knowledge of occlusion, and as James Mark Prime says, "The real purpose, scheme in design and the function assigned to the various characteristics of the tooth must be well understood."

In addition to the equilibration of occlusion, it is most essential that each tooth possess its characteristic anatomic tooth form. Owing to deforming wear, malposition and poor dentistry, many teeth require remodeling or rejuvenation for the reestablishment of normal function. I like the term "rejuvenation" for this procedure because it directs attention to the ideal structure of the tooth in youth; not that we should produce it precisely but that it should be our guide to do that which is indicated. Webster's dictionary gives as one definition of the word "rejuvenate" the following: "To develop youthful features of topography in (an area previously worn down nearly to base level)." So when we reestablish anatomic tooth form, we are developing youthful physical features of the tooth—a rejuvenation of occlusion.

Developmental and supplemental grooves partially obliterated by wear or restoration should be ground into the tooth. Spillways should break marginal ridges and lead into embrasures on the lingual or buccal aspect as indicated. These grooves and spillways are extremely important in relief of stress on teeth. They might be compared to the outlet holes of a kitchen meat-grinder. The handle of the meat-grinder turns easily as the meat is fed into the machine as long as the outlet or spillway holes are

open, but if these holes are closed in the end of the meat-grinder to prevent escapement of the ground-up meat, tremendous pressure is exerted over all the machine when an attempt is made to use great force in turning the handle. And so it is with teeth: if these spillways and grooves are missing, excessive pressure results when food is ground against the food traps and flat surfaces. The underlying tissue suffers from this overload, and from lack of the massage that food would give them in excursion through these natural outlets.

It is likewise important to have lingual, buccal and occlusal embrasures of suitable size and shape. Overstuffed fillings and wide flat contacts often fill up the lingual embrasure. The embrasure should be enlarged by grinding away the fillings or the natural teeth if necessary, so that a normal contact and embrasure is left. The grinding is done from the lingual and gingival aspect toward the contact point. Tapered finishing burs and separating and polishing disks are used for this purpose. "Breathing space" is thus given to the interseptal tissue, permitting massage of the tissues and cleansing of the interproximal surfaces.

Grooves and embrasures are often exaggerated to give additional relief to teeth requiring it. Teeth often refuse to tighten or respond to treatment until this is done. Too much importance cannot be attached to this fact.

Flat inclined planes are made into convex and concave sloping surfaces to coordinate with opposing points of occlusion. Facets of wear are rounded and a general approach to ideal anatomic form is made where practicable.

Occlusal constriction is restored where wear has widened the occlusal face buccolingually. Deformed and extra cusps are so ground that they offer no interference. Fillings too shallow to regroove should be replaced with deeper fillings of proper anatomic form. Poor contact points or teeth lacking in contact should be remedied.

Other mechanical conditions that induce periodontoclasia are restorative work that is too high or too low, teeth with too deep cusps, teeth in nonocclusion, teeth out of alinement, malformed and extra-cusped teeth, bad margins on fillings and fillings so full that they lack correct anatomic form.

Third molars that extrude because the opposing tooth has been removed should be extracted if they interfere in the lateral range of occlusion. They usually produce trauma on the second molar in the opposite jaw and these second molars are often equipped with a poor foundation in the aveolar bone, many of them having conical-shaped roots. The tendency to preserve these third molars for future bridge abutments will decrease when it is understood what damage is caused by their retention.

Bridge pontics are usually made narrower buccolingually than the teeth which they replace, for the purpose of relieving stress. This practice, I believe, is erroneous where balance is established. Few bridge pontics have the occlusal form of the teeth that they replace. The pontic seldom is in function in the lateral ranges because the cusps are not deep enough or do not overlap the opposing teeth enough. Occlusal embrasures between the pontics and pontic and abutment are seldom present, but these places are usually filled with solder, eliminating the lingual embrasure as well as the occlusal embrasure. Spillways and proper embrasures are rarely found in bridges although they are necessary for the health of the underlying tissues. The porcelain pontic should taper sufficiently toward

the tissue to permit free interproximal cleansing and massage.

Removable bridges and partial dentures used as replacement where fixed bridges may be used are detrimental to the teeth used as abutments and to the tissues surrounding them. The present trend toward such replacement is to be deplored. The cast clasps of these cases often act with traumogenic force on the teeth and the occlusal surface is not a fixed base for the opposing teeth to work against.

If removable work is necessary, it is essential to use clasps or attachments that can be adjusted to changing conditions. The commercial laboratories advocating that one-piece cast partial dentures be used where fixed bridges are indicated are doing a great harm, and ultimately discredit is bound to be reflected on the profession.

The prevalence of periodontoclasia is partly due to the failure of operative and prosthetic dental work to meet the exacting demands of Nature. The dentist can prevent a great deal of periodontoclasia by correcting this deficiency as well as instructing the patient in dietetics when it is within his province to do so. Many cases should be referred to physicians to correct systemic involvements that have a bearing on mouth health.

Periodontoclasia is also due to the failure of the dentist to remove the calculus around the full circumference of all teeth.

The so-called prophylaxis given the average patient consists of the removal of the evident salivary calculus on the lingual aspect of the lower anterior teeth and the buccal aspect of the upper first and second molars and the usual cleaning with pumice. The use of a diagnostic light, such as the Cameron light, and the compressed air syringe in locating cal culus is most helpful. The light is held at the gum line on one side of the tooth and the air blown into the gingival crevice on the opposite side. Any calculus, except in very deep pockets, may be thus seen clearly on any surface. I believe this method to be much more certain than relying wholly on the sense of touch to locate the calculus.

Broadening our vision to recognize and cope with all the causes of periodontoclasia will save thousands of teeth that otherwise might be lost and will give us a new weapon of defense against a common invader that is robbing so many of health and happiness.

Mechanotherapy affords one of the most effective means to combat this disease because it complies with the mechanical principles laid down and exemplified by Nature in every high type human masticating machine.

METHODS AND RESULTS IN CONDENSATION OF DENTAL PORCELAIN*

By J. RAYMOND GILL, D.D.S., San Francisco, Calif.

A CONSTANTLY increasing demand by the public for a more artistic reproduction of the natural tooth, especially those teeth within the range of vision, has brought the dental profession to realize that something more than a superficial knowledge of the ceramic art is necessary.

There is a broad knowledge shown in the application of the ceramic arts and crafts. No art at present in use can boast of such great antiquity. No art at present in use by this civilization has such a vast background or fund of available knowledge. While many of the phenomena which appear as the result of the conversion of clays, felspars, and silicates into the final product have been referred to in our literature, few of them have been scientifically explained. We need to know more of the laws under which its varied phenomena may be generalized, before we can teach the ceramic art successfully; before we can satisfy the esthetic reactions and justify the claim that, as applied to dentistry, it is a fine art. We must know more since, because of the exacting demands of the particular region restored, new problems have arisen.

We are coming to realize that the mastery of color and line is not sufficient, that there are other equally important factors: density, homogeneity and strength, which again depend on more fundamental knowledge, that of proper condensation and firing of the clays. It is in the hope that I may throw some new light on this phase of the subject that this paper is presented.

Condensation is the method by which particles are brought in close apposition, water being used to hold the particles in a dense homogeneous mass. The water used is termed hygroscopic water. The porcelain particles absorb some of the water, an expansion of the particles resulting. Most of the hygroscopic water is eliminated during condensation by the use of some absorbent material. The amount of water that can be eliminated, depends largely on the method employed in condensing the porcelain. The hardest and densest porcelain is obtained by removing the greatest amount of water. The remaining water is that which each particle of porcelain has absorbed, and it continues in this state for a period of time, its presence permitting the condensed mass to be carved to form easily. It is removed by evaporation and in the early stages of firing.

TREATMENT OF PORCELAIN PREVIOUS TO CONDENSATION

Water is added to the porcelain to make it sufficiently plastic to be workable. Porcelain can be treated by two methods: by soaking in water for a long period of

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 22, 1931.

time, or by the addition of water immediately before using. The first method has some advantages as it permits the particles to attain greater saturation and causes the material to become more plastic and workable. It also eliminates air bubbles, and a dense, hard homogeneous mass results after condensation. The dry shrinkage and loss of weight are slightly greater than when the porcelain is not saturated. This method of treating porcelain previous to condensation was suggested by Dr. Pilkington of Detroit.

Whichever method is used, either the soaking of the porcelain or the addition of water to the porcelain immediately before condensation, the consistency of the porcelain should be between 3.2 and 3.8. If the porcelain has a lower viscosity than 3.2, difficulty will be experienced in molding it to form before the water can be eliminated. When the porcelain has a viscosity higher than 3.8, air will be easily entrapped between the condensed porcelain and the porcelain that is being added. This is due to an insufficiency of water in the porcelain which is being added and rapid absorption by the condensed porcelain.

The object of condensation of porcelain is to obtain a dense homogeneous mass. To obtain this result, it is necessary to eliminate the maximum amount of the hygroscopic water without weakening the condensed mass of the porcelain. The denser the mass is the longer the particles will retain the absorbed water; which will permit a greater length of time for carving to form. The shrinkage during firing will also be less.

To obtain a dense homogeneous, translucent porcelain crown or inlay of the greatest strength, the method of condensation of the porcelain and the method of firing must be correct. However, this alone is not sufficient, for in order to obtain a porcelain crown or inlay which will possess all qualifications, structure and color also must be considered.

As it will not be necessary to describe the technic employed in the various methods of condensation of dental porcelain, I shall give simply the results and effect of each on the finished product.

The various methods used in condensing dental porcelain are whipping, spatulating, gravitation, vibration without a matrix, vibration in a matrix and mechanical vibration in a matrix.

The tests used to determine the results of the various methods of condensation cover the modulus of rupture, roentgenogram of porcelain before and after firing, loss of water during the drying of the porcelain, density, linear contraction and microphotographs.

The specimens used measured 13 mm. in length, 10 mm. in width and 4 mm. in thickness.

The dry modulus of rupture determines the tranverse strength of dried clay or body mixes in their green state. The test was applied in this research work to determine the transverse strength of each specimen prepared by the various methods of condensation before firing.

The dry modulus of rupture was determined by placing the specimen on two bars which were 11 mm. apart. A pan was suspended from the center of the specimen and shot were dropped in the pan until the specimen broke. The shot and the pan were then weighed.

Three times the breaking load in pounds times the distance between supports in inches divided by twice the breadth in inches times the depth in inches gave the transverse strength.

The transverse strength of each specimen of condensed porcelain is given in Table 1.

The density of the condensed and fired porcelain was obtained by weighing the specimen, first in air and then in water. The difference between the weights of the specimen in air and in water divided by the weight in air gave the density of each specimen, as shown in Figure 1.

The loss of water during drying was measured by heating the specimen to different temperatures. The specimen was weighed before placing in the oven, and weighed at intervals of 200 degrees F. The loss of weight in the specimen indicates the amount of water eliminated from each. The percentage of water loss was determined by dividing original weight minus fired weight by lost weight.

Figure 2 gives the percentage loss of water of each specimen.

TABLE 1.—TRANSVERSE STRENGTH OF CONDENSED PORCELAIN

	Lb. per Sq. In.
Spatulating	11.20
Whipping	9.55
Vibrating in matrix	14.00
Vibrating without matrix	8.96
Gravitation	12.90
Mechanical vibration in matrix	14.03

Within the past few years, the usefulness of the roentgen rays has expanded into fields outside the medical and dental professions. The roentgen rays have been accepted in the metal and ceramic industries as an important asset in determining imperfections of metal and ceramic wares.

Recently, the roentgen rays were employed in the field of dental research in physical sciences. Mr. Shell and Mr. McCormick are using the rays to determine the imperfections in casting and soldering operations in the research department of the University of California College of Dentistry.

With the help of Mr. Shell and Mr. McCormick, roentgenograms of specimens of dental porcelain were taken. By this means, the density and homogeneity of materials used in dentistry are determined more rapidly than by other methods. It permits a larger field of examination than in other tests including the microscopic.

Specimens prepared by various methods of condensation of dental porcelain were roentgenographed to determine their density and homogeneity. Other specimens were roentgenographed after firing at different temperatures to determine the changes and effects of firing.

TABLE 2.—RESULTS OF TESTS

	Lb. per Sq. In.
Spatulating	2.33
Vibrating in matrix	2.37
Whipping	2.31
Gravitation	2.34
Vibration without matrix	2.23
Mechanical vibration in matrix	2.35

TABLE 3.—RESULTS OF TESTS: PERCENTAGE OF WATER BY WEIGHT ELIMINATED FROM EACH SPECIMEN

	Per Cent
Spatulation	18.16
Vibrating in matrix	11.00
Whipping	19.06
Gravitation	14.80
Vibration without matrix	14.20
Mechanical vibration in matrix	19.81

The glazed specimens from each method of condensation were also examined in this way.

The results of the different methods of condensation after glazing were as follows:

1. Vibration in matrix showed a uniform structural arrangement.

2. Condensation by spatulation showed many voids and lack of uniformity in structure.

3. Condensation by the whipping method also showed many voids and a lack of homogeneity.

4. Mechanical vibration in the matrix showed a uniform structure with only a few voids.

5. The gravitation method of condensation showed few voids and fair uniformity in structural arrangement.

The linear contraction and microscopic examination were discussed in an earlier paper.[1]

From the results obtained, it is apparent that there are three methods of condensation that can be considered for discussion: the vibration in matrix, mechanical vibration in matrix and gravitation.

In using the gravitation method, care must be taken that no air is incorporated between the condensed porcelain and that which is being added. To avoid this, it is necessary to vibrate on the die to bring the moisture to the surface, and then add the moistened porcelain. It is therefore important to take the precaution that the moist porcelain has a viscosity between 3.2 and 3.8.

Mechanical vibration in a matrix assures a higher point of rupture, but loss of weight and linear contraction are greater than those from vibration in the matrix, by hand or gravitation. There is less opportunity to entrap air than in vibration by gravitation. Therefore, the results of the density test are higher and the structural arrangement is more nearly uniform.

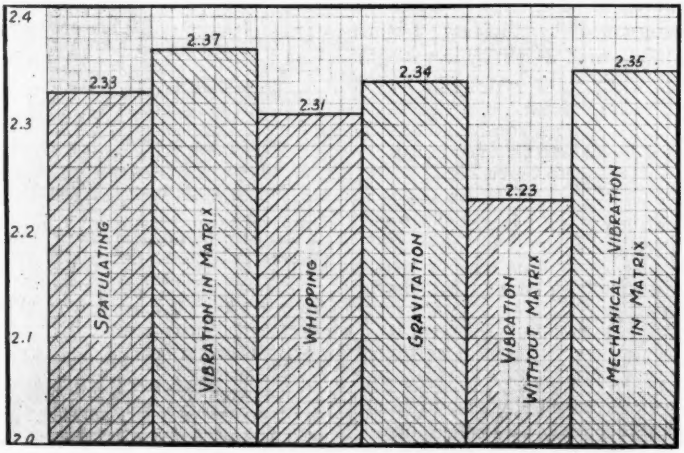

Fig. 1.—Apparent density with different methods of firing.

The vibration in matrix gives the best results with the exception of the modulus of rupture test, for the reason that a greater amount of water has been removed, which decreases plasticity. It therefore has a lower transverse strength, but a greater density and less shrinkage. Roentgenograms show a greater density and structural arrangement of the particles of porcelain.

While I do not, of course, pretend to have exhausted the subject, it seems to me that the results of the laboratory test presented show conclusively that vibration in the matrix, either mechanical or by hand, is the most satisfactory method yet presented.

1. Gill, J. R.: Pyrochemical Reactions in Firing of Porcelain, J. A. D. A., 18:280 (Feb.) 1931.

The greater the density and the more nearly uniform the arrangement of the particles, the more complete and rapid is the chemical reaction during firing.

Mention was made in the beginning of the claim that the ceramic art as applied to dentistry is a fine art. We will all agree that it ought to be. Of course, it is purely an imitative art, for successful imitation is its aim. But as long as it is a true expression of any aspect of nature, it may be a fine art. Only when the onlooker cannot tell which is natural and which is artificial can our art be said to be wholly successful. To fall short of this aim is to risk converting an otherwise pleasant face into a grotesque one. Who of us has not experienced a feeling of disappointment, almost a shock, when a face, attractive in repose, exposes the incongruity of our handiwork by a smile? How impulsively we have wished that the craftsman might also have been an artist! But to attain such perfection, he must face a test not even required of the greatest portrait painter, who always flatters a little; that is, always idealizes nature. We cannot take such liberties with our art. We must copy all her imperfections; all those evidences of age, wear, and pathologic processes and all anomalous markings. A rudimentary knowledge of the surface structure and markings in youth is not enough. We

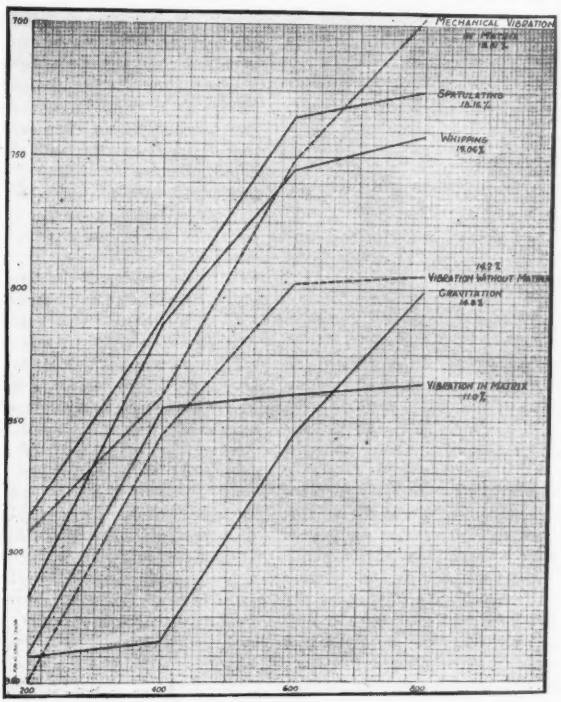

Fig. 2.—Loss of weight during first stage of firing.

must have an intimate conception of the changes that take place with advancing age. Porcelain work is indicated largely in the mouths of those people who have reached middle life and beyond. In a word, we have the interesting but exacting problem of competing with Nature.

Such perfection is not attained every day. Few artists have created many masterpieces, but to have succeeded in accomplishing such perfection only once is worth all the pains it cost. To experience the joy of creating is a reward beyond price. Compared to this esthetic emotion, there is no greater joy. For him who sells his birthright for a "mess of pottage," who is satisfied with the pleasure of salesmanship, the result of the standardized output of the commercialized laboratories, I have no message that he could understand.

DISCUSSION

Russell C. Wheeler, St. Louis, Mo.: To those interested in this work, I would recommend the reading of Dr. Gill's article in the February, 1931, JOURNAL. We who do our own laboratory work in ceramics have known in a general way what takes place in the dental furnace in firing, but there is no other article or book on ceramics which explains the reactions during temperature ranges so simply and yet so scientifically as the above mentioned article. We should have more men interested in dental ceramics, especially the kind of men who will pursue a subject to its logical conclusion. As Dr. Pilkington of Detroit often brings out, there has been too much mystery attached to the subject. Too many men think porcelain work—especially the laboratory end—is far too difficult for them to try. It is difficult, of course; but which branch of dentistry is not, if we are going to perfect the technic? Porcelain work requires the operator to pay the strictest attention to every detail, and that is all. If that is done, with the proper amount of practice and experience, the results will gain the utmost respect from our clientele and will give us more personal satisfaction than almost anything else we might do. The possibilities of esthetic effect and definite result are limited only by the operator's skill. I always compare this work to photography. No matter how much of an amateur you may be, there is always a thrill due you when you await the development of a new roll of pictures. A properly made porcelain jacket, for instance, is so far superior to any other type of crown restoration that the setting of it gives extreme satisfaction. We cannot overemphasize the necessity of doing our own adapting and firing. It is only in this way that the technic can be perfected and the highest results obtained. If this work is allotted to somebody outside the office, how can one learn the importance of proper condensation and firing? How will the operator know what the possibilities are? I might compare one who does this for himself and one who does not with the portrait painter and the photographer. The photographer is limited to chemical and mechanical procedure; whereas, the portrait painter is building up the portrait with his own materials and can build character as well as personality into his finished product as he goes along, being limited only by his ability, experience and observation. The commercial laboratory can achieve fair results, given good instructions and a good cast. But this is not enough, since this work has possibilities far beyond any other type of work, and the laboratory and chair technic can be carried out to a great extent with the patient present; which is an advantage that the laboratory will never have. The laboratory must always work by long distance, as it were. In discussing this paper on the condensation of dental porcelain, I must do so from the standpoint of practical application. I must frankly admit that I have conducted no scientific laboratory experiments with a definite organized technic as Dr. Gill has done. Consequently, when reading Dr. Gill's paper, I unconsciously consider each of his conclusions from a practical standpoint and compare it with my own clinical and empiric observations. In other words: How can we use this information in daily practice? It is perhaps just as well for the purpose of this discussion that we consider this phase since we will have a glimpse of both sides—laboratory application and clinical application. If I had been asked the relative advantages of the different methods of condensing or adapting porcelain powder before reading Dr. Gill's conclusions, I believe I should have enumerated spatulating, whipping, vibrating, etc., in the same order that he did. Al-

though I had no laboratory proof in the matter, practical experience in the different methods helps prove his contention. I am glad to see that although he favors vibrating in matrix, his experiments brought out the fact that spatulating runs a close second. You will recall that the specimen vibrated in matrix resisted 14 pounds per square inch; whereas, spatulating gave a resistance of 11.2 pounds. These tests, if I understand correctly, were made on dry specimens of porcelain before firing. I should be more interested in tests after firing. I believe that the discrepancy between the two methods of condensing would be less. In fusing, the spatulated specimen would react more favorably than the vibrated specimen, although it would show more shrinkage, due to the specimen's containing more hygroscopic water and more air spaces. Since Dr. Gill's specimens rated so high, they must have been well done. One cannot spatulate particles of porcelain in such close proximity to each other as by vibrating in matrix. Nevertheless, spatulating is the most practical method of adapting, and it is a question whether a jacket crown (not a laboratory specimen) will register any better throughout when condensed in a matrix than one spatulated by some one who knows porcelain and who knows how to spatulate, since it is not possible to condense or adapt porcelain by vibration in a matrix entirely if we are to construct a practical case. The difficulties forbid it, owing to the fact that we must perfect the form, alinement and contact points, and this can be done only by spatulation owing to necessary changes. If it were possible to create the form we wanted in a split matrix, we could vibrate the material into position. Since we must at least spatulate to a greater or lesser extent in each case, the total density would be cut just to that degree, the discrepancy in test between the two methods being very little. Whipping gravitation and vibration without a matrix present the same difficulties. We need more men like Dr. Gill who would be willing to investigate basic properties of materials in order that we may have first hand information as to the qualities of those materials with their possibilities.

L. E. Myers, Omaha, Nebr.: As we all know, the working of ceramics is not a new procedure, but I am glad to see so much more interest being taken in it than has heretofore been shown. It has come to stay, and the well-informed dentist will be the one who is able to handle porcelain, and the one who knows how to work with it will want to use it more, and the more we use it in our general practice, the more satisfied patients we will have. As Dr. Gill said, the increased interest of the dentists is caused by the encouraging demand of the public for more artistic and natural reproduction of the human teeth. It is not always that porcelain is indicated where it can be used. However, it behooves us to be prepared so that we can supply it where it is indicated. I fear there are too many of us who wait until the demand for a certain type of work forces us to obtain the knowledge of it, instead of obtaining the knowledge and being prepared to create the demand. As not all of us have the time, or access to equipment, to experiment and learn these facts, it will be well for us all to study this paper, and thereby be able to give our patients a better and finer type of restoration. In working with porcelain, we are prone to lay stress on color and shade; but we must not forget that, in practically all mouths, we find normal teeth of an off-shade, but they all follow the mold and type that harmonize with the face. A well-condensed and well-shaped jacket crown is much to be preferred to one with well-blended coloring and poor condensation. In poor condensation, the air bubbles throw a false light, to say nothing of the specks that accumulate in a poorly condensed piece of porcelain. Dr. Gill mentioned the mixing of porcelain with distilled water as a binder. I doubt the necessity of soaking porcelain for a long period to gain more saturation. I believe thorough mixing with a spatula is quicker, and will produce as good or better results than soaking, and will save much time. If there is any absorption of the water by the porcelain, which I question, I believe there will be a greater absorption of water during the mixing than from allowing it to soak. There is no question in my mind that thorough condensation is the first essential in a well-baked piece of porcelain. I do not believe it necessary to say that one particular method is the only one which can be used. I think the simplest method that will get results should be recommended, and not one that calls for an outlay of expensive equipment. Dr. Gill has proved to us the importance of thorough condensation, but he failed to give us the technic of the vibrating method. Last year before this section in the Denver meeting, Dr. Selberg of San Francisco recom-

mended a machine which he had built as the only means to obtain thorough condensation. It is a clever instrument and would produce very good results, but I fear that if it is necessary to equip oneself with so much expensive apparatus, it will be hard to interest the younger men in ceramics. Dr. Gill has proved to us that mechanical vibration in a matrix is the most effective method of condensing porcelain. He did not explain how he did this vibration—whether he required a special piece of equipment, as does Dr. Selberg, or whether he used an ordinary mechanical vibrator or an instrument with a corrugated handle. I have never considered the vibration with an instrument handle as effective as mechanical vibration, or even the gravitation method. However, since absorbing the results of Dr. Gill's scientific tests, I am free to admit that I have been mistaken and am happy to be started aright again. Since there is such small difference in condensation by vibration and by gravitation, I believe that, in case one does not have a mechanical vibrator, perhaps equally good results can be obtained by using a corrugated instrument handle for vibration, producing the gravitation by the addition of dry powder to take up the hygroscopic water and brushing the dry powder away with a camel's-hair brush. By repeating this two or three times, we are assured a well-condensed product. The matrix, of course, will permit more vigorous vibration, but by the combination of both methods, we obtain a piece of unfused porcelain that can be readily carved and contoured. I have never had the opportunity to test this porcelain in the scientific manner that Dr. Gill has, but on examination, a fractured piece looks like a well-condensed product.

MALRELATION OF THE EDENTULOUS MAXILLA AND MANDIBLE*

By ALDEN J. BUSH, D.D.S., F.A.C.D., Columbus, Ohio

THE Angle classification of malocclusion of the natural teeth may be applied in the classification of malrelation of the jaw in edentulous patients.

One of the greatest errors in dental prosthesis is the attempt to convert Class II or Class III cases into "normal occlusion."

Full denture service as applied to edentulous jaws in malrelation, accompanied by maldevelopment of the face, will be discussed on the hypotheses that (1) the articulating surfaces of the condyles and fossae and the muscular action and habitual excursions of the mandible, during function, are determined by the functional relations of the maxillary and mandibular natural teeth, and (2) the maldevelopment of the face and jaws which accompanies the malocclusion in each class is distinctive and constant and persists without material change throughout the denture history of the patient.

The dental apparatus, unlike the eye or the ear, is not an organ with but a single function. On the contrary, it is a very complex structure with many functions, into which enter not only the jaw, dental arches and teeth, but also the muscles of mastication, the lips, cheeks, tongue, nasal passages, palate and throat. In addition to the function of mastication, the teeth are concerned in the vital function of respiration and also in speaking, deglutition, singing, whistling, laughing and crying; in short, in the expression of all the various emotions.

If the different parts and combinations of parts entering into the performance of these various functions and acts are so

*Read before the Section on Full Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

intimately associated that even slight inharmony in the growth and development of one may ultimately involve the whole apparatus, interfering with the normal function of all, must we not be concerned about providing for these same cases when edentulous artificial dentures that will be in accord not only with the development of the associated parts, but also with the performance of their various functions which have become modified, especially the function of mastication, and also all functions or emotions that involve the tongue and lips?

Fig. 1.—Types of deformity dependent on occlusal relations of teeth. (Angle.)

If the maldevelopment of the face and jaws which accompanies the malocclusion in each class is distinctive and constant and persists without material change throughout the denture history of the patient, it is well to recognize that normal occlusion is just as incongruous when associated with maldevelopment of the face and jaws as malocclusion is when associated with normally developed face and jaws. In other words, both esthetically and mechanically, the normal is just as incompatible with the abnormal as the abnormal is with the normal.

While the teeth are most intimately identified with the function of mastica-

tion, and a full complement of teeth in normal occlusion is a prerequisite for the highest degree of functional efficiency in mastication, malocclusion of the teeth in some form is, according to Dr. Angle, almost the rule rather than the exception and is undoubtedly becoming more common as civilization progresses. We can well apply this statement to prosthesis by saying that malocclusion of the teeth, in some form, should be the rule rather than the exception in full denture service.

If the articulating surfaces of the condyles and fossae, the muscular action and the habitual masticating movements of the jaws are determined by the articulation of the adult natural teeth, artificial teeth must be given the same position as the human teeth that they replace in order to enable the patient to continue these habitual masticating movements which were established prior to the loss of the natural teeth. Furthermore, in speaking, deglutition, singing, whistling, laughing and crying and in the expression of all the various emotions, artificial teeth not so articulated become an impediment just in proportion as they are out of physical harmony with the jaws, which give them support, and out of functional harmony with the muscles of mastication, especially with the lips, cheeks, throat and tongue, which have developed and acquired their functional movements in correlation with teeth and jaws in malrelation.

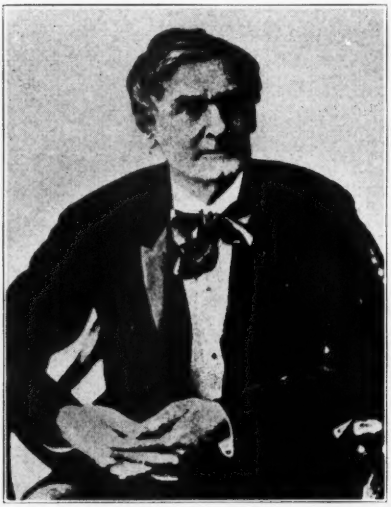

Fig. 2.—Finely molded face developed in harmony with normal denture. (Angle.)

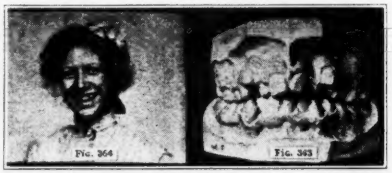

Fig. 3.—Class I case characterized by normal mesiodistal relation of jaws and dental arches. (Angle.)

Fig. 4.—Case falling in division 1 of Class II. (Angle.)

Whether we agree that the habitual masticating movements of the jaw are determined by the articulation of the adult natural teeth, and whether we recognize that the artificial teeth should be articulated so as to enable the patient to continue habitual masticating movements which were established prior to the loss of the natural teeth, and that the patient shall be enabled to continue these move-

ments, which are probably the most efficient that he will ever have, we can still, in the study of facial art, find additional reason for articulating artificial teeth after the general plan of the occlusion that obtained previous to the loss of the natural teeth.

Perfection or deformity of the human face depends largely on the occlusal relations of the teeth. Facial deformities produced by the malocclusion in each class are characteristic of and vary with the degree of malocclusion. (Fig. 1.)

The orthodontist may correct the malocclusion, if taken in time, and Nature will renew her efforts toward the development and growth of all the related parts, and, in favorable cases, establish

Fig. 5.—Class II, division 2, case, characterized by hilaterally distal relation of lower arch. (Angle.)

full harmony of these parts, according to her plan.

On the other hand, if malocclusion is permitted to progress until late in life, and the teeth are ultimately lost after deformity of the face and jaws is permanently established, it is not within the province of the dental prosthetist to reclaim opportunities lost to the orthodontist.

Dr. Angle states:

Notwithstanding that the effect on the facial lines of the varying forms of malocclusion found in the three different classes varies not only with the degree of malocclusion but somewhat with the individual type of face, yet the facial deformity produced by the malocclusion in each class is so distinctive and constant that after some practice the orthodontist may even classify, with considerable accuracy, the malocclusion of the people he meets without an actual examination of their teeth.

Thus, this knowledge possessed by the orthodontist becomes a challenge to the dental prosthetist, for he is entirely dependent on facial contours as an index to the character of the natural dentition.

It can be readily recognized that the finely molded face with its firm chin and mouth shown in Figure 2 (Angle), was developed in harmony with a normal denture. Also, it may be readily recognized that denture service for an edentulous case of this type calls for artificial teeth

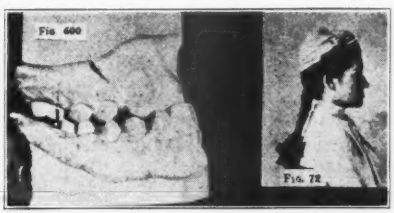

Fig. 6.—Class III case, characterized by mesioclusion in one or both halves of lower dental arch

in normal occlusal relations, for two reasons: (1) to maintain the natural contours of the face and jaws; and (2) to maintain conditions most favorable to the continuance of the normal functional movements of all of the various correlated parts which characterized the case before the natural teeth were lost.

It may be difficult to diagnose malocclusion as having previously existed in an edentulous mouth, but usually, by close study of the mouth in its relation to the other features and by observation of the relation of the mandible to the maxilla, a definite opinion can be formed re-

garding the occlusion of the previous dentition.

It would be interesting to know what percentage of people reach adult life with a full complement of teeth in normal occlusion and subsequently become edentulous, but since normality of tissues in general predisposes to health and longevity, and since malocclusion is the rule rather than the exception, it would seem safe to assume that the greatest percentage of edentulous jaws are found in those cases which, in the beginning, or during the developmental period, showed maldevelopment in some form.

Out of several thousand cases of malocclusion examined by Dr. Angle, the number per thousand belonging to each class was as follows: Class I, 692; Class II, 266; Class III, 42.

Class I (Angle) is characterized by a normal mesiodistal relation to the jaws and dental arches. (Fig. 3 [Angle].)

When patients presenting Class I cases become edentulous, they are, according to the degree of malocclusion which previously existed, more or less adaptable to artificial dentures in normal occlusal relation, so-called, but, for esthetic reasons, the positions of the anterior teeth should be governed by the lips, which unerringly reflect the character of the dentition over which they developed and functioned.

Class II (Angle) cases are characterized by the lower arch being distal to normal in relation with the upper arch.

According to Dr. Angle, about 25 per cent of all cases of malocclusion fall within this class, and, furthermore, about 33 per cent of this class fall within Division 1 (Fig. 4), which is described by Dewey as follows: Bilaterally distal relation of the lower arch, protruding anterior maxillary teeth, narrow upper arch, undersized chin, undersized mandible, abnormal muscular pressure, abnormal atmospheric pressure, a short and underdeveloped upper lip and mouth breathing.

When one who is afflicted with this extreme class of malocclusion, and becomes edentulous, applies for full denture service, the dental prosthetist is confronted with a condition that does not present one single feature that is mechanically or esthetically favorable to artificial dentures in normal occlusal relations, so-called.

On the contrary, the malrelation existing between the maldeveloped maxilla and mandible, the abnormal muscular action in connection with malformed dental arches and jaws, the perverted functional excursions of the mandible which are substitute motions for functions that cannot be normally executed, all present anatomic, mechanical and esthetic conditions which, *per se,* harmonize only with artificial dentures in Division 1, Class II relation.

What is true of Division 1, Class II, is also true of subdivision, Division 1, Class II, since they have the same characteristics, but it is well to note that, in Division 1, the lower arch is bilaterally distal and the subdivision is unilaterally distal, and prosthetic procedures are affected accordingly.

Division 2, Class II (Angle) (Fig. 5 [Angle]) is characterized by the bilaterally distal relation of the lower arch and is further described by Dr. Dewey as including retruding and bunched maxillary anterior teeth, an upper arch nearly normal in width, a normal-sized chin and mandible, normal muscular pressure and normal breathing.

The subdivisions of Division 2, Class II have the same characteristics as Division 2, except that the lower arch is unilaterally distal. When persons showing this type of malocclusion become eden-

tulous and seek artificial denture service, the prosthetist is again confronted with evidence which is a more or less complete record of the previous dentition, and it is well for him to appreciate this fact; to analyze this evidence, and to prescribe artificial dentures according to this evidence.

About 4 per cent of cases of malocclusions are in Class III (Fig. 6). The condition is characterized by the mesioclusion in one or both halves of the lower dental arch, with a corresponding facial deformity and mesial inharmony in the relation of the mandible to the maxilla.

If persons showing this class of malocclusion become edentulous in the early stages of its development, full dentures may be supplied with the anterior teeth in occlusal contact; but if the malrelation of the mandible with the maxilla has progressed the width of a bicuspid or more, the artificial dentures most certainly should be placed as indicated in Class III malocclusion.

Dr. Dewey has made this observation regarding the relation between malocclusion and facial art:

> With a certain malocclusion, there is always a certain action of the muscles, a certain manner of breathing and a certain action of the teeth in mastication, so that the facial development associated with malocclusion is always easily understood and recognized. In other words, if given a model of a case of malocclusion, it is possible in a great number of cases to describe or draw the type of face that the patient possesses.

No doubt, Dr. Dewey could reverse the operation, and, in a great many cases, if given a model of a deformed face, he could describe or draw the type of malocclusion that the face should possess. Whether he can or cannot do this, we do not know, but we can safely presume that orthodontists never make any use of this knowledge. With the prosthodontist, the situation is different. He should not only possess this knowledge in a very high degree, but he also should be very skilful and diligent in the use of it.

All that has been said in the foregoing regarding the principles of occlusion and articulation as applied to denture service for edentulous maldeveloped jaws in malrelation is applicable to edentulous normal jaws in normal relation; the key to the occlusion, for use in prosthodontic procedures, which is quite different from the key to occlusion as understood and used in orthodontic procedure, being found in relation of the mandible to the maxilla and the characteristic and permanent effect that the natural dentition had directly and indirectly on the facial contours.

683 East Broad Street.

DISCUSSION

M. E. Niswonger, Dayton, Ohio: Dr. Bush will be given credit for calling attention to the malrelation of the edentulous maxilla and mandible, and classifying malrelations similarly to Dr. Angle's classification of malocclusions; namely, Class 1, 2 and 3. The A. D. A. Librarian informs me that no papers on this subject are listed in the Dental Index. In addition, in seven prosthetic textbooks in the A. D. A. Library, nothing on this subject was found. Apparently, we were completely ignorant of or have avoided this subject, although Dr. Bush read a paper on the classification of malrelations of the edentulous maxilla and mandible before the First District Dental Society of New York City, March 4, 1918.[1] At that time, Norman Essig of Philadelphia, in the discussion of Dr. Bush's paper, stated, "I do not see how we managed as well as we have up to the present time, nor do I see why we have not appreciated certain phases of this subject, when, as a matter of fact, it has been crying for recognition for years." For another thirteen years, malrelationship continued to cry for attention; until this afternoon, when the subject was again presented. This presentation, and the words of Dr. Essig just referred to, should make us realize the broad vision members of our profession sometimes have, and how this vision,

1. Bush, A. J.: J. Allied Soc., 13:134, June, 1918.

lacking attention and credit, will fade, unappreciated. Linking with Dr. Bush's studious and practical observations, are those of Dr. Skinner, of Los Angeles.[2] Apparently, we have been contemplating construction of all dentures employing the ideal normal occlusion, unaware of existing malrelated ridges, etc., which prevent the arrangement in so-called ideal normal occlusion. Esthetics, as applied to dentures, has been in somewhat of a state of stagnation. We are ready to correct this condition. Dr. Bush has one of the keys to the situation, and by it we may give the patient dentures in harmony with his own type. Furthermore, as stated by Dr. Bush, it is not within the province of the dental prosthetist to reclaim opportunities lost to the orthodontist. If we fail to recognize the facts presented here, our patients may well continue to say "false teeth." False means not well founded, not in harmony; while artificial is defined as created through the practice of art, and art is the skilful adaptation and application to some purpose or use of knowledge acquired from Nature. Do we want to make false teeth or to create artificial dentures?

William R. Humphrey, Denver, Colo.: I believe that it is best, in patients past middle age, to avoid as much as possible a change of habit. It seems to me that our problem is one of compromise. In placing a denture, we must give the patient the greatest degree of efficiency in mastication and assure esthetics, comfort and freedom from trauma. These, of course, are problems for the prosthetist. The part of the paper I wish most to discuss is this statement: "The Angle classification of malocclusion of the natural teeth may be applied in the classification of malrelation of the jaw in edentulous patients." While it is true that the Angle classification may be applied to the classification of the edentulous ridge, it should not be, I believe. The Angle classification is based upon the occlusion of the first permanent molars. The Angle classification consists in its entirety of four classes, two divisions and three subdivisions, all based upon the positions of teeth and not upon the relationship of the ridges. In many so-called Class II or distoclusion cases, when the teeth are extracted and the mouth is properly prepared, the resultant ridges are practically in normal position. Angle's classification, as well as Lischer's, which was given to the orthodontic profession by Dr. Lischer about 1912, used the terms mesial and distal for deviations from the normal. Dr. Simon of Berlin has added another classification wherein the jaw relationship is dealt with apart from the tooth position. Simon uses the terms protraction and retraction. It is possible, then, by his classification to have a mandibular protraction with a dental and alveolar retraction.

It is these facts which led me to review the literature in search of a classification of the edentulous ridges. Wright,[3] of Pittsburgh, uses the terms normal, prognathous and orthognathous in illustrating mandibular-maxillary relationship. I found these terms quite generally used. My disagreement with Dr. Bush on his borrowing an orthodontic classification, based upon dental malocclusion, has led me into a very interesting study. In dental ridge areas, we have two surfaces to deal with, and in relating them one to the other, one being fixed and the other movable, the most descriptive terms for deviations from the normal are anterior and posterior, lateral and open. Therefore, I suggest that Dr. Bush consider as a basis for study of your problem, the following classification: normal; anterior, anterior right lateral and anterior left lateral; posterior, posterior right lateral and posterior left lateral; anterior open, posterior open, right open and left open. It is possible with this classification to describe the relation of one ridge to the other no matter what its position may be. Subdivisions could be used to classify anomalies or pathologic conditions, as, for example, the lingual relation of the maxillary ridge to the mandibular. With this classification, or one similar, as a basis, this discussion can be carried on more clearly. It is confusing (to me to least) to try to understand this paper when using an orthodontic classification. I do not believe Dr. Bush really means to set teeth into positions of malocclusion, as described in the Angle classification. I believe that he refers to placing them in positions of maximum function in an anterior or posterior relation. It is a pleasure to discuss a paper in a section that one is unaccustomed to attending. I have learned a great deal from this excellent paper.

2. Skinner, C. N.: Biologic Conditions in Relation to Heredity and Environment as Regards Size, Form and Harmony of Osseous and Dental Structures, J. A. D. A., 18:1719 (Sept.) 1931.

3. Wright, W. H.: Systematic Charting of Records in Prosthetic Work, J. A. D. A., 12: 154 (Feb.) 1925.

CORRELATION OF CONCEPT AND TREATMENT IN ORTHODONTIA*

By ANDREW FRANCIS JACKSON, D.D.S., Philadelphia, Pa.

GOOD orthodontic results are of a necessity a combination of correct concept and treatment. These two should be in logical harmony with each other.

Scientific investigation and observation have disclosed many facts of invaluable service to us. On this basis, many theories have been propounded and systems of treatment devised, some of them exceedingly good, others amazingly illogical and ill-founded.

The object of science is to see things as they are, to draw conclusions from facts and to experiment freely in order to discover the truth.

Theories in themselves are as harmless as the equation of dynamite, but few of us are anxious to be present when bombs are exploded. Figuratively speaking, this is what often happens when unproven theories are put into practice.

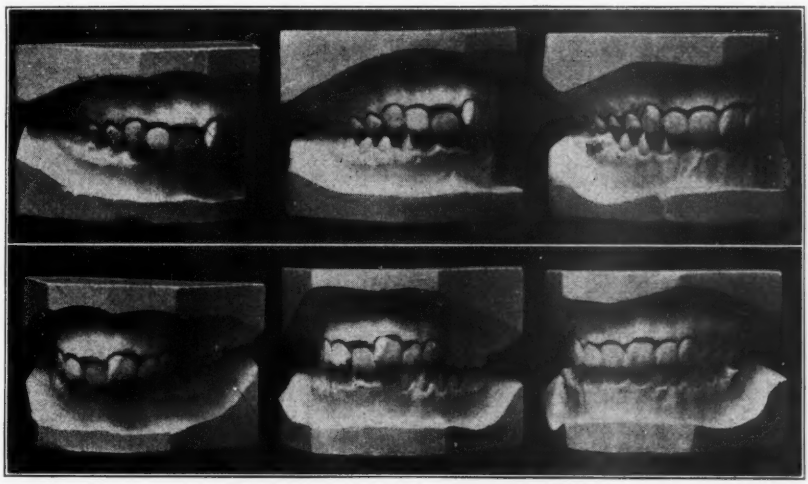

Fig. 1 (Case 1).—Unilateral distoclusion.

The most commonly fatal mistake an orthodontist can commit is to try to make his cases fit theories or systems of treatment, particularly of a mechanical nature, rather than to accept, on suspicion,

*Read before the Section on Orthodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

whatever there is good or sensible in any of them at its relative value.

In order to arrive at a really comprehensive concept of orthodontia, we should consider as the most valuable information that supplied us by the anthropologists. These men have the habit of thinking in terms of thousands, if not millions, of years, and therefore have the best concept of man's cosmic relation to the universe. They tell us that the whole anatomic structure of man is undergoing constant change in conformity with the fundamental law of adaptability to environment. If this is true, it is logical to infer that the underlying cause of all malocclusion of the teeth is a natural condition of maladjustment of the individual to environment during this period of transition.

The order and general tendency of these changes are quite evident in viewing humanity from the standpoint of the mass. On this basis, average normality can be more or less estimated. The mass of humanity, however, is made up of countless millions of persons in whom the variations are often extreme, producing conditions which are very unsatisfactory for the particular individual.

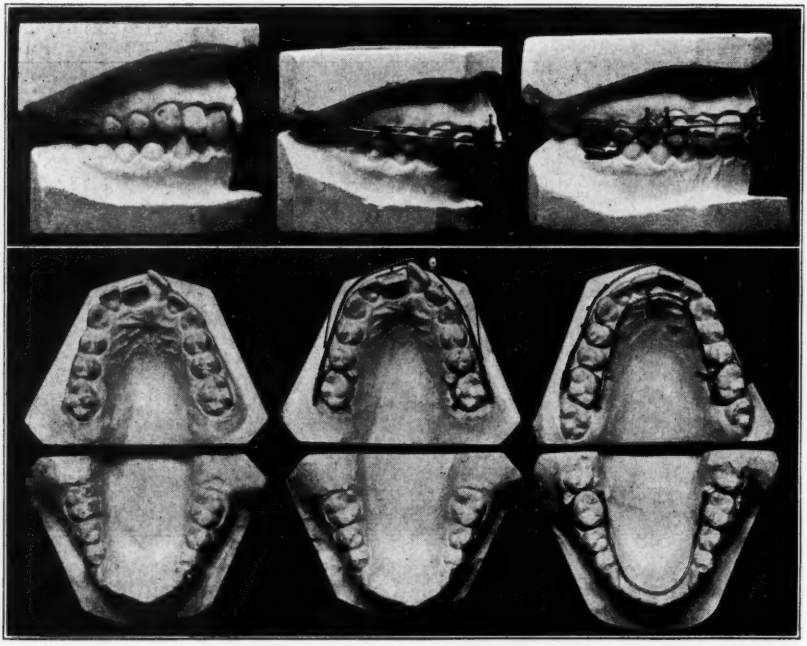

Fig. 2 (Case 1).—Appliances placed to correct condition shown in Figure 1.

Orthodontic treatment is concerned with the particular individual, not with theoretical averages. It is concerned with the particular improvements which can be obtained for a person within the limitations which the life conditions of the

individual impose. Good orthodontic treatment consists mainly in estimating correctly the factors involved from the standpoint of a comprehensive whole. When we take into consideration the infinite number of life factors involved in a single individual, it is apparent how impossible it is to determine what we might call the normal for that individual. Even if this could be determined, it is impossible to change some of the factors which might be considered responsible for certain abnormalities.

It is true that, from the anatomic forms of the teeth, their relation to each other and the orientation which they as a whole should bear to the skull, we have a fairly accurate idea of what this arrangement should be under ideal conditions of adaptability. Our problem lies with the forces which are involved when these conditions do not exist.

The result of all natural forces is a state of balance, which from the orthodontic standpoint may be considered satisfactory or unsatisfactory, as the case may be. When unsatisfactory, our efforts are concerned with so arranging the dental tissues that a state of balance will still obtain.

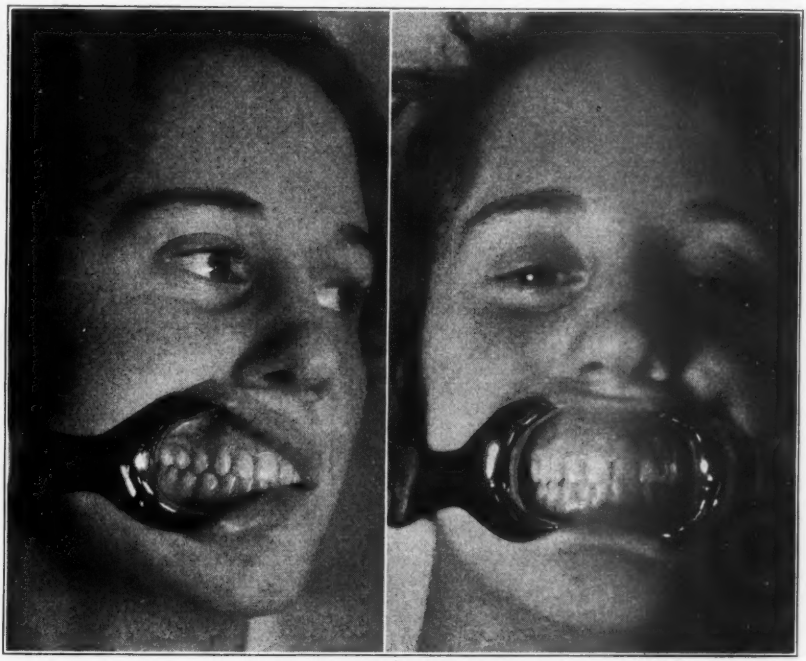

Fig. 3 (Case 1).—Results of treatment.

The factors that we are mainly concerned with are heredity, growth and development, function, anatomic proportions and certain abnormalities peculiar to the dental organs. The combinations which these factors can produce are prac-

tically limitless in number and of enormous complexity.

Possibly the nearest approach to a definition of the objective of orthodontic treatment is: "The best arrangement of the dental organs possible within the biologic, functional and esthetic limitations to produce the most efficient and artistic ensemble which will remain in a state of permanent balance after treatment is completed."

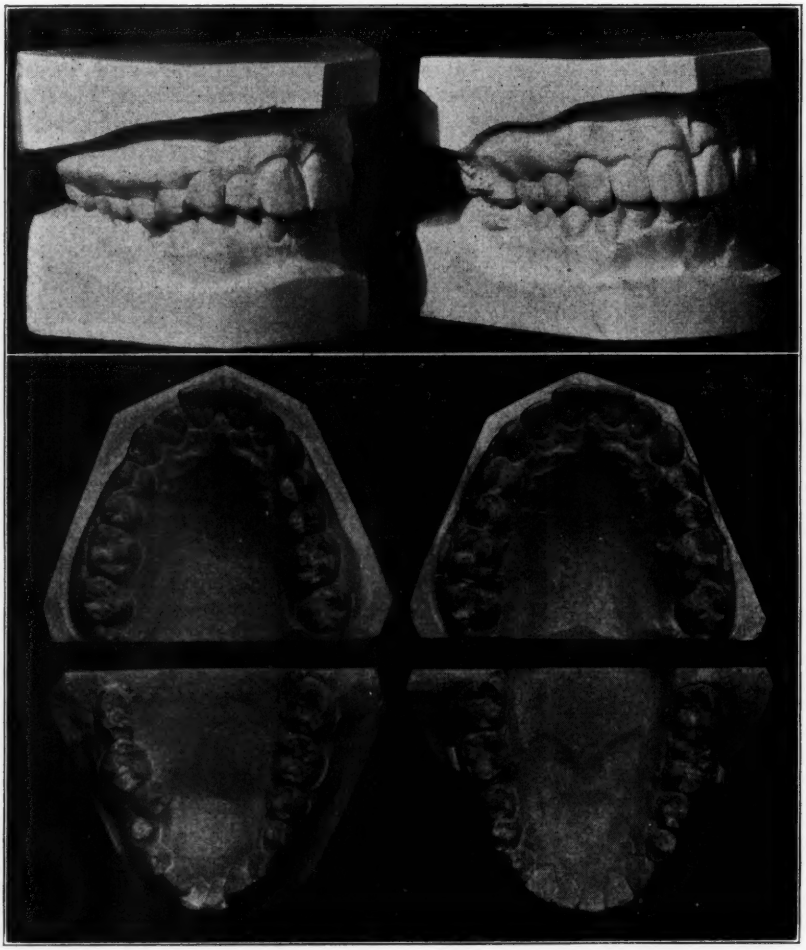

Fig. 4 (Case 2).—Case of neutral occlusion.

Physiologists claim that personality is the most complex subject in the universe and the pure scientific observation can

explain only a small fraction of its phenomena. The complexities concerned with orthodontia place it in the same category, and the sooner an orthodontist realizes this, the better. The scientific, intellectual approach has to be supplemented with something more subtle.

"Knowledge has two forms: It is either intuitive knowledge or logical knowledge; knowledge obtained through the imagination, or knowledge obtained through the intellect; knowledge of the individual or knowledge of the universal; of individual things or of the relations between them; it is either the production of images or of concepts."

The origin of art lies in the power of forming images. The sciences take us away from the individual and the actual into a world of increasingly mathematical abstractions which often issue into momentous conclusions of no practical importance. Art takes us directly to the particular person and unique fact. Imagination precedes thought and is necessary to it; the artistic or image forming activity of the mind is prior to the logical concept forming activity. Man is an artist as soon as he imagines and long before he reasons.

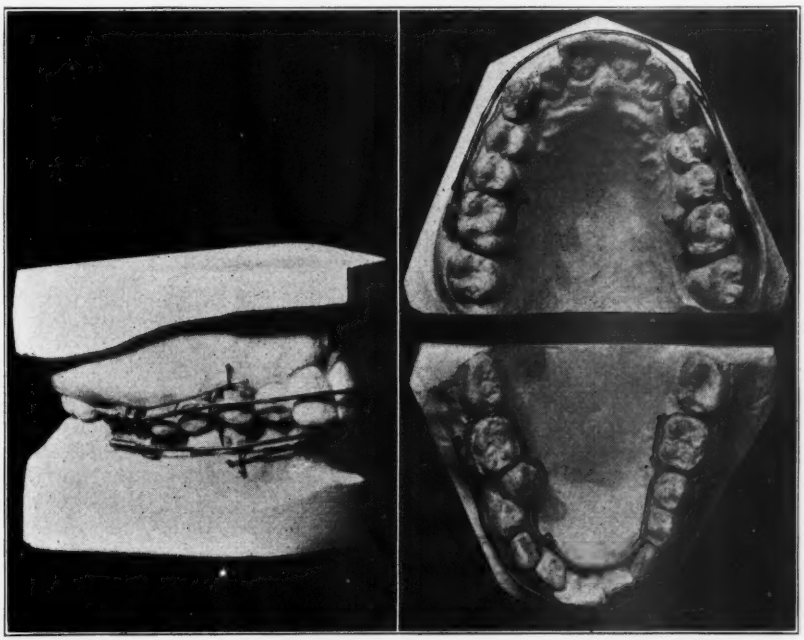

Fig. 5 (Case 2).—Appliances used to correct condition shown in Figure 4.

The results of practical experience can usually be embodied in certain concrete general principles which are applicable to a vast variety of individual cases. In this particular, Dean Inge, that brilliant English churchman, has this to say about the teachings of Christ, "He wrote no book, he made no laws, he simply laid

down a few general principles applicable to everybody." The object of this paper is to present in the simplest possible form a description of the principles that I have found most useful in orthodontic treatment and their application to a selected number of case reports from my own practice. These comprise in themselves many of the problems involving decisions which necessarily had to be made.

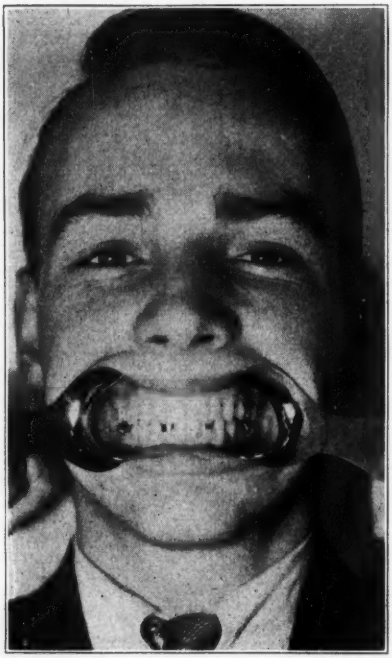

Fig. 6 (Case 2).—Results of treatment.

The object is not so much to show the results obtained as the particular method of mental approach which I have found to be the most reliable guide in arriving at some estimate of the factors involved.

As a first general principle, I believe there is no better method of evaluating the factors involved than by a thorough personal study of the living subject, allowing the fullest freedom to the powers of imagination and visualization. Success in practice depends from first to last on personal judgment in evaluating the factors with their variations to a comprehensive whole and allowing nothing to interfere with the free exercise of this judgment.

As the first step, therefore, some experimenting should be done by getting the patient to occlude the jaws in as nearly the position of so-called normality as possible and noting the interference which may be present and which prevents the patient from doing so habitually. Orthodontia is not concerned with statistics but with dynamics. This simple procedure will usually disclose obvious facts of such simplicity but far reaching importance that the first step in mechanical interference will usually immediately suggest itself as a logical sequence. After mechanical interference is instituted, a complete reevaluation of the factors involved should be made at each visit of the patient, as all action is followed by reaction and accompanied by interaction. The dentist, like a good general, should at all times be ready to change his original plan of procedure, however well thought-out this may be, and even to alter his original objective, his decision depending on the reaction of the tissues and the limitations which may be disclosed during the course of treatment.

A general principle which I feel to be of the utmost importance is: Always consider the relationship of the jaws from the standpoint of a unit and never undertake individual movements of teeth of one jaw or changes in the relationship of the jaws without due consideration for compensatory and complementary movements of the opposing jaws. These movements should always be carried on simul-

taneously, so that, at all times during treatment, the minimum amount of trauma may be produced.

One of the faculties which an orthodontist must develop is the capacity to visualize in the vertical as well as the horizontal plane. This faculty, combined with recognition of the general principle that form and function go hand in hand, will overcome one of the great stumbling blocks in treatment and will of itself usually suggest the most desirable form of mechanical interference to be employed.

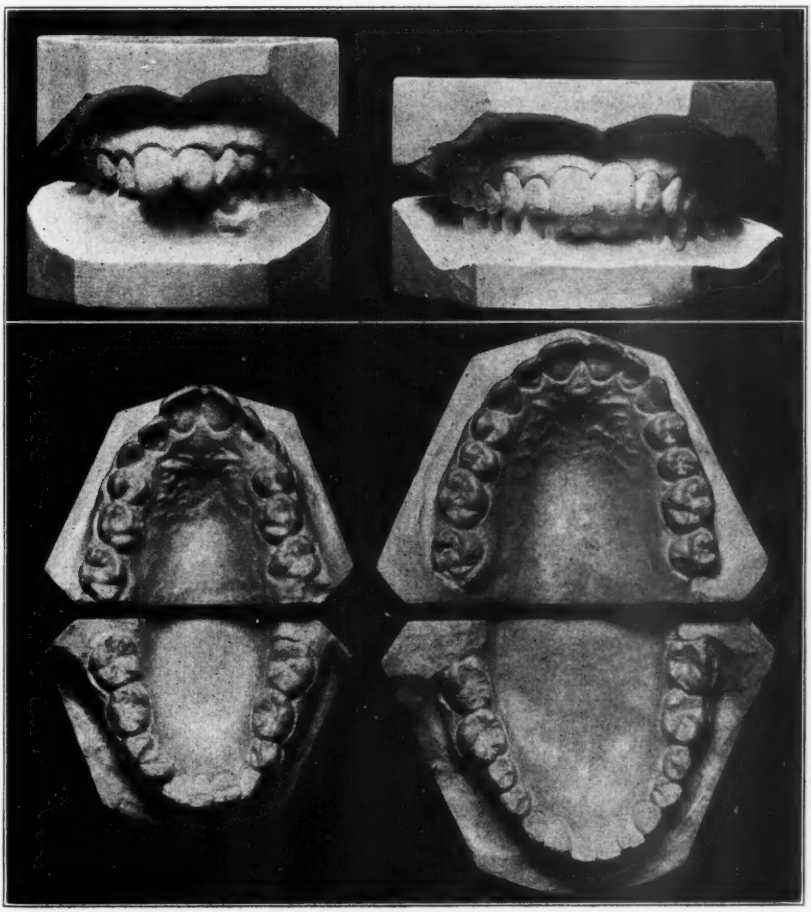

Fig. 7 (Case 3).—Case of neutral occlusion before and after treatment.

A general principle never to be forgotten or underestimated is the fact that we are at all times dealing with living tissue, subject to intelligent control,

through the voluntary muscles of the person on whom the work is being done, and that the form of mechanical interference should often be designed merely as an aid or reminder to the wearer of what the correct function should be.

From the standpoint of treatment, the proportion of tooth substance to jaw development is basically a biologic and esthetic problem. The rearrangement of the teeth is basically a mechanical problem. The relationship of the jaws to each other is basically a functional or physiologic and psychologic problem.

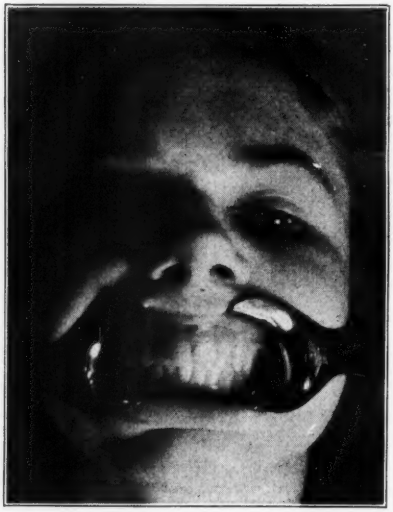

Fig. 8 (Case 3).—Results of treatment.

Mechanical interference *per se* is concerned with and must be properly correlated with a number of very subtle problems involving conditions which, unfortunately, cannot be accurately estimated scientifically. These might be stated as: (1) the limit to which artificial stimulation can be successfully carried; (2) the age at which treatment is most desirable; (3) the length and rate of treatment; (4) the histologic nature of the bone to be treated and the effect on it of mechanical stimulation; (5) the size and muscular tension of the oral cavity to be treated; (6) the muscular and mental capacity and control of the person to be treated; (7) the selection of the most suitable appliances for the individual cases to be treated.

In the following case reports, the mechanical appliances will be described only briefly as they have been fully covered in other papers.

REPORT OF CASES

CASE 1.—Figure 1, left, shows the right (above) and left (below) side of a case of unilateral distoclusion of the right side with supraclusion and malposition of the incisor teeth. The first decision in this case was that a normal occlusion (with a full complement of teeth) was biologically possible and artistically desirable.

Figure 1, center, shows the right and left side of the case with the teeth placed, despite their malposition, in as nearly the position of normal jaw relations as possible. This at once discloses the fact that the immediate cause of interference is the position of the upper right central and left lateral incisors. Therefore, the first logical step in treatment is to remove this interference. This was accomplished by means of the appliance shown in Figure 2, center. A labial arch with labial auxiliary springs was employed as shown.

The immediate result of this treatment was to move these teeth labially and distally, thereby removing the interference and creating space for the rotation of the left central incisor. At this point, an upper lingual crib was inserted, as shown in Figure 2, right. This performed the dual function of maintaining the right central and left lateral incisors in their new positions and forcing the patient to bite forward in order to find a comfortable place to occlude the teeth. At the same time, the upper right first bicuspid was banded and the labial arch ligated to this (Fig. 2, right). The upper left central incisor was banded and an auxiliary spring soldered to this band and sprung under a knob soldered to the labial arch (Fig. 2, right).

A lower lingual arch was inserted and intermaxillary elastics were used, on the right side only, in order to swing the lower jaw forward and to the left. The action of these elastics also drove the right upper molar slightly distally and created spaces between the teeth on the right side. These teeth were then individually moved distally with auxiliary springs until the normal relation of the teeth and jaws was attained.

An adjustable retainer was then placed on the upper teeth. The final result is shown in Figure 1, right, and Figure 3. The time consumed in the entire active treatment was about one and a half years.

CASE 2.—Figure 4 illustrates a case of neutral occlusion involving the partial impaction of the lower right bicuspid, a drifting of the lower incisors to the right side and general constriction of the upper and lower arches.

The first immediate problem again involved the decision that a normal occlusion, with a

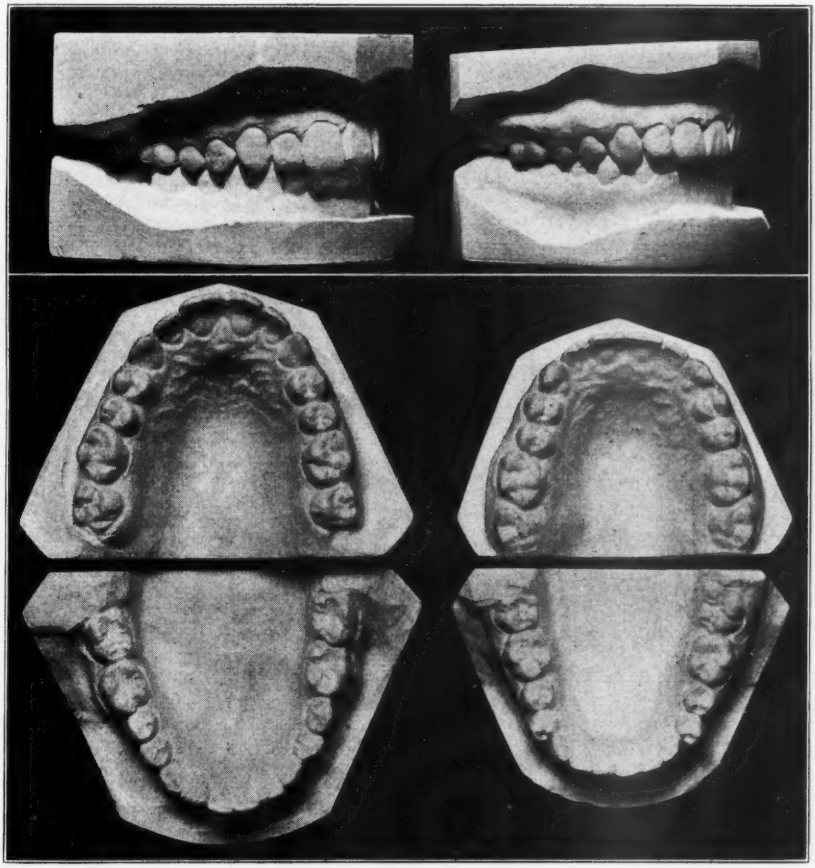

Fig. 9 (Case 3).—Left, models of teeth of patient in Figure 8 and, right, models of teeth of patient shown in Figure 10.

full complement of teeth, was biologically possible and artistically desirable. The first mechanical problem was the question of creating space between the lower right molar and cuspid for the accommodation of the second lower right bicuspid. To accomplish this, a lower labial arch was inserted with a labial auxiliary spring acting on the lower right cuspid to move this tooth mesially and labially. At the same time, an auxiliary spring was used to move the lower left cuspid buccally and distally.

The action of the labial auxiliary springs is always to cause the teeth to which they are attached to move slightly in the direction of the points of attachment of the springs.

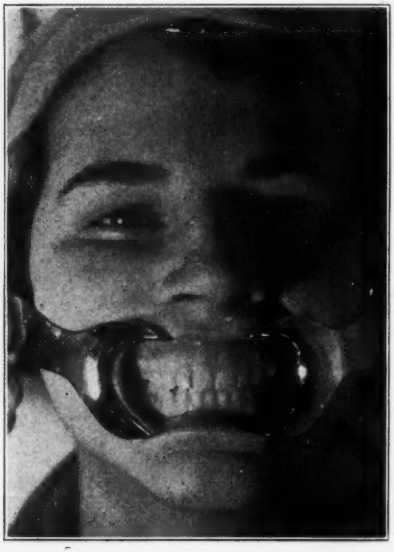

Fig. 10 (Case 4).—Results of treatment.

Simultaneously with this treatment on the lower teeth, a labial arch was inserted on the upper jaw with auxiliary springs attached to the upper cuspids; causing these teeth to move buccally and slightly distally. This coordinated the movements of the teeth on each jaw. This simultaneous action avoided the traumatic occlusion which might otherwise result from a disregard of this basic principle. Simultaneous expansion of the upper and lower labial arches was also employed to move the upper and lower first permanent molars buccally and again avoid traumatic occlusion during the movement of these teeth.

After sufficient room had been obtained in this manner for the accommodation of the teeth and the correct artistic proportion of the arches, two lingual arches were inserted. Lingual auxiliary springs were attached to these to carry the upper and lower bicuspids into their correct positions. A few minor adjustments were also made to aline the lower incisor teeth, after which a lingual bite plane was inserted in the upper to produce the correct vertical arrangement of the teeth.

The active treatment occupied slightly less than one year and the patient is at present using for retention a lower lingual arch lying under knobs soldered on bands on the lower lateral incisors and an adjustable bite plane retainer on the upper arch.

The appliances used are illustrated in Figure 5. A photograph of the patient after treatment was completed is shown in Figure 6.

CASE 3.—Figure 7 shows the models of a case of neutral occlusion before and after treatment.

The models to the left, made before treatment, show a condition of considerable constriction of the arches complicated by extremely large upper incisor teeth. In the lower arch, the right lateral incisor was in apposition with the first bicuspid; the lower cuspid lying labially directly in front of the right lateral.

It is a difficult thing, with the patient at an early age, to visualize what the final result will be in cases of this kind. It was decided to produce the expansion necessary for the accommodation of all the teeth, and Figure 8, a photograph of the patient after completion of the work, justifies the belief that the decision was correct. It will be noted that there is no apical constriction of the bony substance around the roots of the teeth and that the proportion of tooth substance to facial development is pleasing.

Mechanical interference similar in principle to that employed in Cases 1 and 2 was used.

Figure 9 shows the models (left) of the teeth of the patient in Case 3 (Fig 8) with the completed models (right) of the teeth of the patient shown in Figure 10. These illustrate the vast difference in proportion that may exist in the sizes of the teeth which may yet, individually, constitute parts of a harmonious whole.

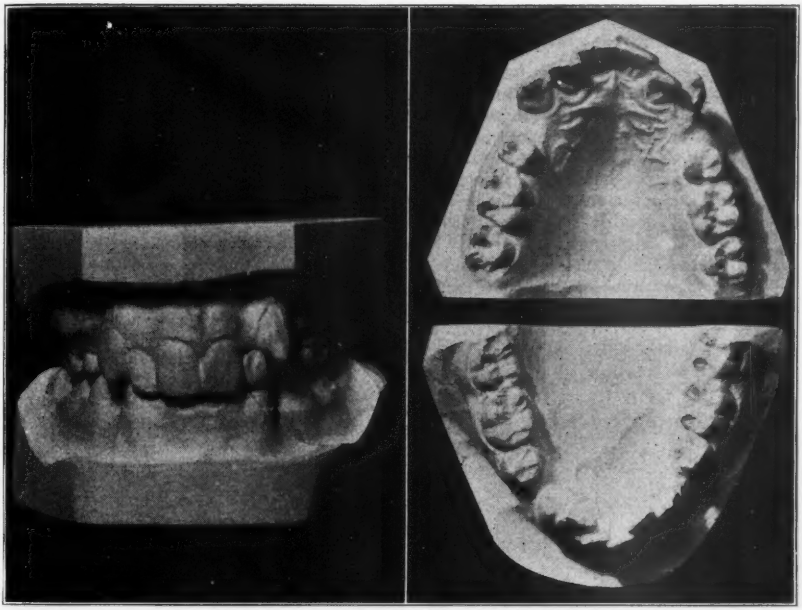

Fig. 11 (Case 4).—Case of neutral occlusion.

Fig. 12 (Case 4).—Results of treatment.

CASE 4.—Figure 11 shows the models of a case of neutral occlusion complicated by constricted arches and crowded incisors on both upper and lower jaws.

This case involved a difficult decision. After taking all the factors into consideration, the extraction of the upper and lower first bicuspids was finally decided on. This decision was reached mainly through the insistence of the parents of the child under consideration.

Figure 12 shows the results after the treatment was completed, which are a justification, in themselves, for extraction of the teeth in question. To attain artistic harmony was far better than to attempt to place all these teeth

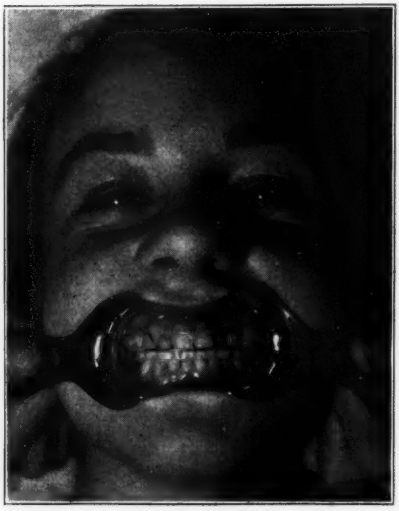

Fig. 13 (Case 4).—Appliance in place.

in position, and it is very doubtful that it would have been possible biologically to maintain these teeth in satisfactory occlusion, had it been attempted. The reasons for this are that, notwithstanding the extraction of these teeth, there was still apical constriction due to lack of bony development, and experience in the moving of these teeth, as well as the experience had in the treatment of a brother of this patient, led to the belief that there is a peculiar condition of bone density in this particular family. (There is a great difference in the bone density of individuals, a factor which must always be considered in treatment and on which we have very few definite data at present.)

Figure 13 shows in place the appliance which was used to a great extent in moving the cuspids and lateral incisors distally. This is mainly an adaptation of Crozat's recurved springs, adapted to a fixed appliance, which he has used so successfully with his particular forms of removable appliances.

CASE 5.—Figure 14 shows a case of distoclusion with extreme labial version of the upper incisors, complicated by crowding of the lower incisors and a condition of open bite.

In this case, the decision was made to extract the upper first bicuspids only. The result of the treatment is shown in Figure 15.

This case was presented for treatment at a rather late period, at about 16 years of age, at which time many of the functional habits of the patient had become firmly fixed and therefore much less amenable to permanent change than if treatment had been instituted at an earlier age. It will be noted that the upper lip is so short that the upper incisor teeth are constantly exposed, notwithstanding their retraction, made possible by the extraction of the bicuspids. What the condition was before the extraction can well be imagined. (It is to be regretted that photographs were not made of this patient before beginning treatment.)

As is common with all open-bite cases, the habit of constantly playing the tongue between the teeth was also firmly established. It has been my experience that the use of intermaxillary elastics, even when most carefully employed, always has a grave tendency to aggravate open-bite conditions, so that their use, in this case, might have produced disastrous results. Therefore, I felt justified in pursuing the treatment outlined.

This case is presented to show a combination of conditions which requires great delicacy of judgment in order that its factors may be evaluated in their relation to each other, and thus a satisfactory compromise, feasible of attainment, result.

CASE 6.—Figure 16, left, above and below, shows a typical case of bilateral distoclusion. Above, center, the teeth are shown placed in as nearly the position of normal occlusion as the malrelation of the teeth and jaws would permit; disclosing the fact that the most important factor to be considered is the vertical arrangement of the teeth. Appliances very similar to those used in the first case described were employed, with the difference that inter-

maxillary elastics were used on both sides. The upper lingual bite plane was pinched bilaterally with the wire stretching pliers at intervals of from four to six weeks, which reminded the patient constantly to bite farther forward of the position which had become habitual. This was continued until the normal relation anteroposteriorly and a normal vertical arrangement of the teeth were acquired. Simultaneously with this, a slight rearrangement of the incisor teeth was effected, producing the result shown in Figure 16, right, above and below.

Figure 17 shows three photographs of the patient after treatment was completed. At the left is the labial aspect of the patient with an adjustable bite plane retainer in place; at the right, the lingual aspect of the same. This particular appliance I have found of extreme value in maintaining the correct bite until

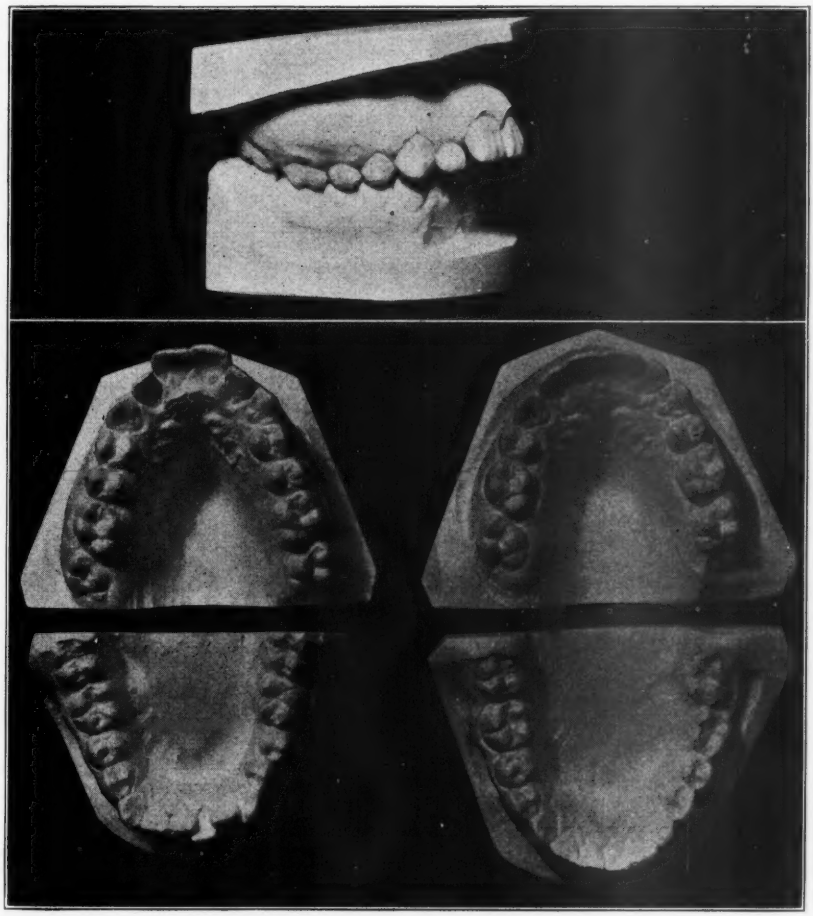

Fig. 14 (Case 5).—Case of distoclusion.

the tissues have thoroughly adjusted themselves to the new relation.

The most casual consideration of the treatment of a handful of cases, selected at random reveals the fact that our scientific information is alone entirely inadequate to cope with the complexities of the problems involved. We must, of necessity, supplement this knowledge with some reasoning of a highly speculative nature, and our treatment of cases with artistic feeling of an intuitive nature.

Fig. 15 (Case 5).—Results of treatment.

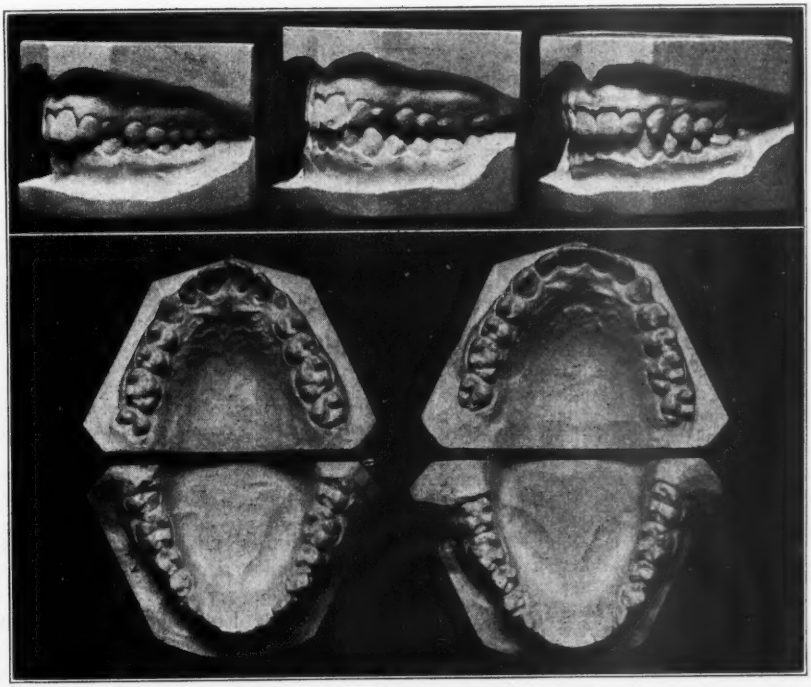

Fig. 16 (Case 6).—Typical case of bilateral distoclusion.

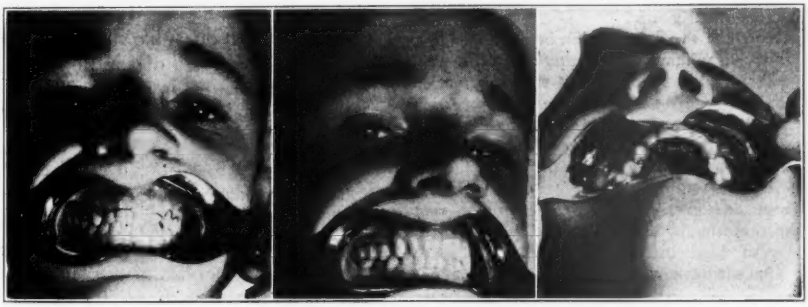

Fig. 17 (Case 6).—Results of treatment.

THE PROBLEM OF THE UNETHICAL DENTIST*

By BERTRAND T. CONNELL†

THERE recently appeared in one of the New York evening newspapers an editorial which I shall quote in full, for I feel that it stresses a point which the dental profession might well consider:

DOCTOR AND PATIENT

What is one to do when he needs a doctor? In a town or small city this question may raise no particular difficulty, but in a metropolitan center it presents a serious problem,—a problem which, it is gratifying to note, is being recognized by leading members of the medical profession. Dr. John A. Hartwell in his address as president of the Academy of Medicine of New York faces it frankly. The state, he observes, licenses a practitioner of medicine and thereafter exerts no control over him whatever, unless he becomes guilty of a felony. "He is at complete liberty to undertake the care of any type of patient and to institute any therapeutic measure that he deems advisable." It follows that if the public is to be properly served medically, it will have to be provided with information which will enable them to select doctors intelligently.

How can this information be supplied? Dr. Hartwell, without any beating about the bush, declares: "The furnishing of this information would seem to be a function of the profession itself." But by what method can this information be made available? No satisfactory method, he admits, has been devised. He suggests the setting up of sort of a clearing house and gives it as his own opinion that the task should be undertaken by the Academy of Medicine.

One serious abuse in medical practice might be greatly reduced by such an agency. This is the activity of the commercially minded doctor who may or may not cross the uncertain line of malpractice, but whose diagnosis is careless and whose ministrations are indefensible. Dr. Hartwell touches upon a very important point when he speaks of the inattention of the state to a man or woman whom it has licensed to practice medicine. Malpractice is not easily proved; moreover, there are many steps in the mishandling of a case which fall short of malpractice but are equally deserving of a condemnation. The state cannot well review these activities. But a recommending body of physicians could do a great deal to discourage them and thus protect the public against what is in effect fraud.

The editorial might well have read, "Dentist and Patient"—indeed, it might have been more pertinent, more appropriate and more deserving had it been so entitled.

Unfortunately, commercialism has been the bane of dentistry's existence. From the obscure and uncertain origin of dentistry, the sinister specter of the unethical practitioner has haunted and hindered the progress of the profession. The earliest dentists were charlatans, magicians, tribal priests and fakers who preyed on the superstitions of the people. The dentistry of the Roman Empire was practiced by slaves. Guerini, in commenting on this fact, says, "An art practiced with the sole purpose of making money soon degenerates to the level of a trade; it is, therefore, hardly to be wondered at if very few doctors of that epoch have merited being recommended in history." Later, in England and on

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the Continent, the barbers of the day assumed the duties of the dentist as well as their tonsorial obligations. G. V. Black, in speaking of the dentistry of the middle eighties, refers to itinerant dentists, men of no settled abode, who wandered through the country or from town to town.

At the present time, this self-same specter of the unethical practitioner is just as prevalent, if not as prominent, as in any period of the past.

William D. Tracy, in a paper read before the Connecticut State Dental Society, commented with telling effect on this, going deeply into the subject, when he said:

> The menace of commercialism in our profession must not be ignored. It stalks across the path of our progress in a manner that must disturb the mind of every thinking practitioner. It even has a hold upon some of our institutions of dental learning, and if the commercial spirit prevails in a dental school, is it rational to assume that the graduates of that institution will be free from the taint?

To my mind, the unethical dentist falls into two classes: (1) the man who publicly advertises his profession, commonly referred to as an "advertising dentist" and (2), to use the words of the editorial previously quoted, "that class of men whose diagnosis is careless and whose ministrations are indefensible." These two classes are as different as night and day, as opposite as black and white. Only in that they both tend to degrade and demoralize the dental profession are they similar.

The advertising dentist is a man who, in effect, looks on dentistry as a trade rather than as a profession; an unscrupulous person whose sole object in practicing dentistry is the accumulation of wealth. He preys on the poor and the uneducated, and by adhering to the economic principle of small profit and large turnover, reaps a harvest. This type of dentist builds up and maintains a practice very largely through the medium of advertising in local newspapers. Subtle and cleverly worded advertisements easily divert the unthinking to their offices. The "advertising dentist" is not a product of one locality: he is found in every section of the country and his "ads" appear in almost every newspaper of the nation, particularly those papers that appeal to the type of people he caters to. These advertisements are all basically the same, and their appeal to certain people cannot be denied. But this is not the only means of enticing a practice into the office of the advertiser. Prominent corners are always the rule, huge electric signs are frequent and window placards intimating certain special ability are common.

That this type of man cannot possibly do even fair work is perfectly obvious to anyone who is at all thoughtful. Their small fees and large practices preclude any possibility of good results. On the other hand, the harm they do is incalculable. The question naturally arises, where do these men come from and why are they permitted to remain in a profession essentially honest and decent? They come from any and every dental institution in the country; though more frequently from the inferior schools. Once graduated, they present a difficult problem. The state, having licensed them, exerts no control over them unless they become guilty of a felony. The fact that they are not members of recognized dental societies, and therefore are usually not eligible for insurance, does not bother them in the least. Indeed, they are not the type to be concerned with societies or even insurance.

Mr. Robert O. Jones, in an address delivered before the Virginia State Den-

tal Association, in commenting on this very situation, ascribes the inability of the dental profession to combat this evil to lack of leadership, vigorous organization and a comprehensive program of health education. While it undoubtedly is the sacred duty of the honest men in dentistry to expose, publicly, the sinners within its fold, the dental institutions must, I feel, assume much of the blame, for allowing such men as these to graduate into the profession. I do not think for a moment that the "advertising dentist" becomes commercially minded entirely because of the policies of the school that he attended. The fact that many such men come from schools above reproach belies this.

The matter, to my mind, goes farther back than the dental school. I believe that these people are victims of their own materialistic environment, brutal in its realism and lax in its conceptions of goodness and honesty. These men lack that touch of idealism, that trace of altruism, that understanding of human nature and that rigid code of honor that the ideal professional man must possess. The fault lies with the institution for accepting these men as students. Schools should keep in close contact with their graduates, perceive just what type of professional men their graduates become, and, in this way, be better able to judge what type of men to accept as students.

The second type of unethical practitioner that we must contend with, the men whose diagnosis is careless and whose ministrations are indefensible, is even more common than the advertising dentist, and the problem he presents is far more serious. These men are clothed in the garments of respectability—frequently, they are leading figures in dental societies, men looked on by the laity as well as by their fellow practitioners as diligent, conscientious workers. In truth, they are wolves in sheep's clothing. The nefarious practices of men of this class are many and varied.

First, we have that type who outwardly and to all appearances are practicing dentistry to the best of their ability, but who in their hearts are as commercially minded as the advertising dentist save that they have not the courage of their convictions, the courage to advertise. These men are constantly and knowingly doing poor work, crowding their appointments to a point where no one receives adequate treatment, yet all the while charging fees commensurate with honest labor.

Then, we have that jovial, smiling type who laughed their way through college and to a degree of dental surgery, and who are now bluffing their way through life with the aid of a glib tongue and a good laboratory: men long on personality and short on ability. Many of this class, if the truth were known, have not the requisite knowledge to be practicing at all. Men such as these are found particularly in the specialties. Included in this class are those who seek to impress their patients by means of subtle conversation or scientific-appearing apparatus prominently placed in their offices; in short, any one who knowingly and deliberately tries to create in the minds of his patients an unreal estimate of his worth. A truly professional man need never sell himself to the public.

Finally, we have a very large group whom we may conveniently classify as the discontented—men who have qualified as dentists, but who, for one reason or other, seemingly cannot devote their best energies to their work. Unfortunately, their patients suffer the most

from their unhealthy frame of mind. Found in every field of endeavor, this class of men presents one of the real tragedies of life—honest, diligent men who find themselves temperamentally unfitted for that calling to which they have devoted the best years of their lives. Concerning these men, Dr. Tracy has aptly said:

> Every occupation, when taken seriously, has its drawbacks, its disadvantages, and its limitations, and it is easy to see that success, even in a limited measure, depends not upon doing what you like to do, but more upon liking what you have to do. While this may not be possible in all cases, it is largely a matter of mental adjustment and is quite possible in most cases when the individual is in earnest about his work.

All these types that we have discussed under the classification of men whose diagnosis is faulty and whose ministrations are indefensible are found frequently, all too frequently, and the havoc they create presents a difficult problem. We cannot openly accuse them of malpractice and of being commercially minded, for malpractice is hard to prove, and, after all, they adhere to all the requirements of the state societies regarding commercialism. We cannot declare that they are unethical, for ethics, for the most part, is a vague, intangible thing, something which exists in the heart and mind and cannot be set down in rules or writing. Yet, if the public is to be properly served medically, to quote from the editorial cited above, it will have to be provided with information which will make possible the intelligent selection of doctors.

How can this information be supplied? Dr. Hartwell declares, "The furnishing of this information would seem to be a function of the profession itself." This is a laudable suggestion, but to put it into actual practice is another problem. I have often wondered if this health education was not a duty of the state. The state is very insistent that its citizens have a certain minimum amount of education; but of what value is this if its subjects are lacking in bodily health? I have frequently wondered whether it was more important to know, for example, that the Ural Mountains separated European from Asiatic Russia, or to be able to understand just when one was ill and in need of a doctor, or when one's teeth were faulty and required immediate dental care. Why could not public health and personal hygiene be studied bit by bit, year by year, as are reading, writing and arithmetic? After all, it would not require a great amount of education for one to be able to realize that he was being treated by a reputable physician or dentist.

CELLULITIS OF THE FACE*

By GEORGE W. CHRISTIANSEN, D.D.S., Detroit, Mich.

CELLULITIS of the face is probably the most dreaded complication with which the oral surgeon must cope. The rapid onset, with temporary disfigurement, always alarms the patient and his relatives. Several days must pass before the process subsides, and, during this time, the patient is seriously ill and very uncomfortable. The family is apprehensive. Anxiety prompts them to request consultation, frequently with an old family friend, who too often is utterly unfamiliar with such cases. A neighbor usually adds to the unpleasantness by recalling a similar case brought on by supposed untimely removal of teeth, and the age-old accusation of improperly sterilized instruments may also be heard.

Acute cellulitis of the face is an inflammatory condition which involves the cellular tissue of the side of the face and neck, or of the floor of the mouth. The edema may spread with amazing rapidity, and, in the face, frequently assumes huge proportions, closing or even obliterating the eye. Because of fixation of the tissues, movement of the mandible is very painful and difficult. If the involvement is in the submaxillary area, the edematous mass is extremely hard and presents the familiar boardlike rigidity so characteristic of this condition. The swelling frequently forces the mucosa of the floor of the mouth higher than the occlusal plane of the lower teeth; the tongue being pushed upward and backward, with consequent pressure on the glottis. Respiratory embarrassment is common, and the patient is more comfortable with the head of the bed raised. The temperature and pulse are elevated and dehydration increases with the illness. In the unusual case, the temperature may rise several degrees within a few hours. Pain, as a rule, is not so great in the beginning, but may become extremely difficult to control after the malady is well established. Now the real problem of managing the case begins. Swallowing is almost impossible, and, as a result, the patient becomes weak from lack of food and fluids. Respiratory difficulties become more distressing and pain may be of a constant and severe nature.

Nearly a century ago (1836), Ludwig described this submaxillary condition as a distinct clinical entity. His description, a masterpiece, is unfortunately too little known.

A sore throat of a rheumatic or erysipelatous nature precedes as a rule the first symptoms, which are: slight rise in temperature, with a number of chills, headache, weakness, some loss of appetite, slightly coated tongue, some difficulty in swallowing, which is slight at the early stage, and in some cases scarcely noticeable; then a hard swelling develops, either on both sides of the throat or more commonly on one side, usually in the cellular tissue that surrounds the submaxillary glands, less frequently in that around the sublingual or parotid. This hard growth extends, with some tissue changes, gradually around the throat, then under the jaw to the chin, and down over the larynx, and often backwards into the cellular tissues of the parotid, also

*Read at the Thirteenth Annual Meeting of the American Society of Oral Surgeons and Exodontists, Memphis, Tenn., Oct. 16, 1931.

causing a marked swelling on the outside. This growth also extends through the cellular tissues that cover the musculature between the larynx and the oral cavity and even these muscles themselves are sometimes apparently involved in this hardening process: the tongue, deep red in color, rests on the hardened mass thus formed, which is felt as a hard indurated ring on the inner circumference of the larynx. The ability to open the mouth is much limited, and every attempt is painful;

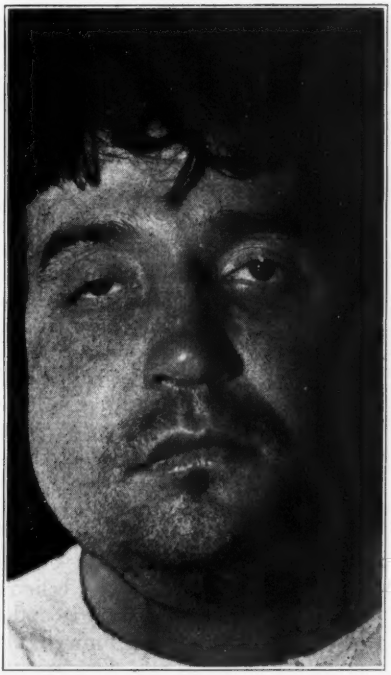

Fig. 1.—Midline incision from symphysis to hyoid bone.

the tongue is pressed upward and somewhat backward; speech is made difficult, and partly because of the pressure on the larynx, and partly because of the morbid changes in the smaller throat muscles, it is rough and not clear, and gurgling. Swallowing becomes very difficult, with straining of all of the throat muscles, due undoubtedly chiefly, if not entirely, to the mechanical pressure of the growth, because of an inflammatory swelling of the mucous membrane of the pharynx present either at the beginning of the disease, or later if mercurial drugs are used in treatment. Yet with the progress of the disease a considerable amount of mucous gathers in the throat, which is expectorated with difficulty. The skin over the growth appears normal, not reddened, at least in the earlier stages, although stretched according to the size of the growth—evidence that its cellular layers are not involved in the hardening process. During the first four to six days of development of this local growth, the constitutional symptoms are not marked, the fever is usually very moderate, the strength

Fig. 2.—Lateral view of patient shown in Fig. 1; extension and swelling up to temporal fascia.

and general feeling are a little altered, appetite and ability to sleep are not lost entirely, there is some thirst, secretions and excretions are fairly normal. As the disease progresses, some areas of redness of the skin are noted, inside the mouth frequent exudations of inflammatory lymph appears (if this has not occurred before), the growth under the tongue seems softer, as if the serum under the mucous membrane was effused and partly coagulated. On the outside certain areas become softer, sinking in somewhat, and if

pressed with the finger, feel as if there was air under the skin, or sometimes they become more prominent and fluctuating, as if pus was going to break through, but this does not occur, and the swelling diminishes—or, sometimes at the beginning, and sometimes later in the course of the local process, some spots in the oral cavity, either at the back or sides of the root of the tongue, or more to the front on the under side of the inferior maxilla, break out and discharge a thin, grayish or reddish brown fluid, with bad odor, which

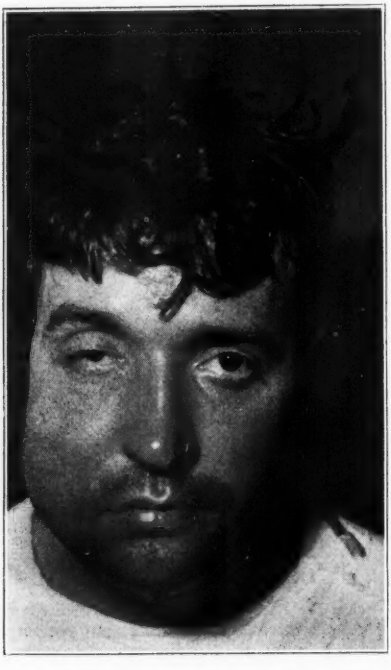

Fig. 3.—Front view of patient shown in Figures 1-2.

becomes more and more like the ichor of a necrotic process. With the beginning of this process, which is of the nature of mortification, the general symptoms become more marked. The fever is higher, exacerbations usually in the morning, the sleep is broken with heavy sweats, frightful dreams, somnambulism, there is marked increase of sediment in the urine, sometimes slight delirium. Notwithstanding the fact that the growth may diminish in size, swallowing is still very difficult, there are periods of anxiety with fairly free intervals, a non-mechanical, but apparently nervous interference with respiration. The symptoms now develop rapidly, simulating the course of a putrid typhous process, and in four or five days, the tenth or twelfth from the beginning of the disease, coma and death result with evidence of edema of lungs. There are variations in the symptoms noted, especially in the development of the fever, the time of the development of the disease and the severity of the local process, which I will not discuss in detail, as my purpose is to give a general picture of the disease that will aid in its recognition at the bedside.

Cellulitis may follow such operative procedures as the extraction of a tooth, excessive trauma in difficult cases and the recovery of roots in badly mutilated referred cases. Sometimes, an acute abscess following death of the dental pulp will cause such severe edema as to force suppurative material into the deeper tissues. This may occur while the root canal is receiving classic treatment in the hope of saving the tooth. A subacute pathologic process about an unerupted or partially erupted third molar may suddenly flare into activity if surgical interference takes place during an acute attack. To sew the flap, after the removal of impacted third molars instead of incising a portion of it, is to invite trouble. Dr. Coakley believes that most of the infections come from the mouth organisms passing through the mucous membrane of the floor of the mouth or side wall of the pharynx, but that some of them come from carious teeth. Zinsser says the origin is usually in the teeth, tonsils or pharynx, or perhaps a peritonsillar abscess.

The first evidence of trouble is the persistence of swelling and the complaint that opening of the mouth and swallowing are difficult and painful. The condition does not improve, as in the usual postoper-

ative ailment. On the contrary, each day the general picture grows worse.

As in simple facial abscess, hydrotherapy may be of value. Wet compresses of boric acid, magnesium sulphate or the application of from 10 to 20 per cent sulphonated bitumen (ichthyol) may aid resolution. Care must be used to apply hot or cold dressings as indicated. If the inflammation is very severe, heat will dilate the vessel walls still more and increase the pain. In such cases, cold applications are demanded. If the leukocyte count is low, the injection of foreign protein such as 5 c.c. of milk at forty-eight hour intervals may be helpful. General supportive treatment is imperative. When necessary, subcutaneous saline and rectal feeding are of great value.

Because cellulitis is a generalized inflammatory process, the familiar pointing of an abscess or carbuncle does not occur. Usually, a portion of the mass will soften slightly owing to the subcutaneous formation of fluid. When we are certain that localization is complete, free drainage should be established and maintained by a rubber dam. The incision should be extensive enough to permit a thorough search for associated pockets of pus, if necessary. Blunt dissection with small curved artery forceps is best suited for this. Care must be used to avoid unnecessary trauma or any exploration which might break through the defensive barrier. The tissues in the midline from the symphysis to the hyoid bone may be incised boldly with no fear of encountering trouble. A deep incision is frequently necessary because the pus may lie beyond the deep cervical fascia or even in the vicinity of the mylohoid and geniohyoid muscles. Exploration laterally from the hyoid bone outward to the angle of the mandible must be guarded because of the presence of such vital structures as the contents of the carotid sheath and the facial artery and vein. No effort should ever be made to expel the fluid forcefully. Unnecessary trauma may force septic material along the lymphatics into the blood stream. Here, it is well to remember that a deep midline opening will frequently drain extensive areas in the face.

The choice of anesthetic should receive careful consideration. Frequently, a skin injection is as painful as the incision itself. It also has two definite drawbacks: It may be relatively ineffective and it may spread the infection.

On the other hand, one of the chief concerns at any time is that the patient breathe freely. Respiration is always handicapped in these cases and sometimes severely so. Peritonsillar abscess is not an uncommon complication, but we may be unable to detect its presence because of the patient's inability to open the mouth. If a general anesthetic is used in such a case, manipulation of the external tissues may rupture the tonsillar tissues, and, by liberating a large amount of pus in the throat, produce a grave, if not a fatal, respiratory impediment.

PATHOLOGY

Cultures grown from pus frequently show an almost pure strain of streptococci, staphylococci or colon bacilli and staphylococci.

C. N. Dowd, in a résumé of fifty-one cases of cellulitis, states that, in thirty-two of these, the streptococci were present alone or predominantly; while, in nineteen, *Staphylococcus pyogenes-aureus* was the prevailing organism exhibiting a tendency to spreading inflammation with undermining of the tissues. In all of the latter cases, streptococci were found.

Dr. Welch, of Johns Hopkins University, states:

All of the affections caused by one species of the pyogenic cocci may be caused by any of the others. For example, the staphylococcus aureus may produce cellulitis, etc., as well as the streptococcus pyogenes. The streptococcus pyogenes may possess all degrees of virulence, and far more frequently than other bacteria causes spreading phlegmonous inflammation and grave forms of septicemia.

Hans Zinsser says:

The inflammation which is known as Ludwig's Angina is usually of a streptococcus haemolyticus nature and consists of a violent, acute inflammation of the areolar tissues of the submaxillary region of the neck.

In the following cases, the apparent cause of the cellulitis was different in each instance.

REPORT OF CASES

CASE 1.—Mr. R., aged 39, complained of soreness and pain in right lower jaw. Examination revealed a partially erupted third molar and some deep soreness under the jaw. Pressure along the lingual surface caused the escape of a thin purulent discharge.

Under general anesthesia, the tooth was removed with little difficulty. Within six hours, the patient was acutely ill, the face being greatly swollen and the temperature and pulse elevated. He was immediately hospitalized, the temperature rising to 105 F., with intense pain and evidence of severe toxemia. Rectal feeding was used and two injections of 5 c.c. of foreign protein were given forty-eight hours apart.

No improvement was noted until the eighth day, when the submaxillary mass began to break down and soften. A skin injection and a deep midline incision were made, and profuse drainage was obtained, followed by relief from pain and other distress. Culture from the pus showed an almost pure growth of streptococci.

CASE 2.—Mr. D. developed a severe Ludwig's angina following the removal of lower posterior teeth. Breathing was interfered with, but the chief complaint was extreme soreness when swallowing was attempted. Because of a marked erythema over the area selected for drainage, a general anesthetic was used. Just after the incision was made and blunt dissection started, the patient stopped breathing. The mouth was forced open, the tongue brought forward and the throat aspirated of mucus and pus; but in spite of all efforts, the patient died. Necropsy revealed a draining supratonsillar abscess, which was undoubtedly ruptured from the manipulation of the external tissue.

The use of a local anesthetic might have prevented the fatality. Culture of the pus showed streptococci and staphylococci, with the former dominant.

CASE 3.—Mr. R., while out of the city, developed soreness in the right lower cuspid and some sublingual swelling. Five days later, on his return, the tooth was opened. No drainage took place. The sublingual swelling had increased, and the tooth was removed. A submaxillary swelling developed which required not only excision externally, but in the floor of the mouth as well. Probably the early removal of the cuspid tooth would have prevented the deep penetration of the organisms. Culture of the pus showed principally staphylococci and streptococci.

CASE 4.—Mr. H. gave a history of severe sore throat following pain and swelling around a carious left lower posterior tooth. The right side of the throat was opened, but no pus was obtained. Almost immediately, a cellulitis developed, and the patient was again hospitalized. Six days later, a midline incision (Fig. 1) was made. Figures 2 and 3 show the lateral involvement extending up to the parotid and temporal regions, and yet drainage from the sublingual opening was very effective.

In this case, the attempted drainage of the throat may have been premature and the instrumentation may have carried organisms through the fascia to a point where progress downward under the muscle was possible. Culture of the pus showed an almost pure streptococcic infection.

CASE 5.—Mr. W., aged 62, came in for the removal of root tips of the left lower first molar. The attempted extraction of the tooth had been unsuccessful four days previously but was accompanied by severe laceration followed by considerable swelling. This had subsided, but a lump remained over the submaxillary gland. The root tips were recovered under nitrous oxid anesthesia. Almost immediately, a cellulitis developed; pain on swallowing being so great that the patient even refused fluids. He did not void; dehydration, in spite of subcutaneous fluid, became severe, and, on the fourth day, he died, presumably of acute uremia.

In such a case, one is inclined to believe that the fatal complication was the result of the operative procedures.

SUMMARY

As a rule, the tendency is to incise the affected area too soon. This is prompted by uneasiness over the patient's discomfort and a natural desire to bring relief at the earliest possible moment. Proper drainage requires definite localization, and incising before this seems justifiable only when the pressure on the tongue is great enough to interfere seriously with breathing and we feel that opening the tissues may partially relieve this. Zinsser says:

It is an important observation, confirmed by much experience, that if incision is practiced in the indurated and inflamed tissue before the process has come to a central head, infection is usually spread, perhaps by the opening of adjacent lymphatics. Therefore, there is much judgment required in treating even these simple lesions. Faulty surgical interference may easily convert a simple furuncle into a dangerous carbuncle.

Careful watch of the blood count may be a valuable guide. If the total leukocyte count is around 8,000 and the polymorphonuclear count above 90, we may be sure that the patient's resistance is poor, and we must avoid surgical interference. If the whole white count is high, from 13,000 to 20,000, the chances that the bacterial invasion will be vigorously resisted are much better.

The point of opening, of course, should be where most free fluid can be detected subcutaneously, but, when possible, a deep midline incision is best because: 1. The incision may be as deep as necessary without endangering vital structures. 2. An incision on a line from the symphysis to the hyoid bone is the lowest point and will frequently drain higher areas. 3. The resulting scar is less noticeable.

In the types which are slow to break down, the injection of foreign protein into the buttocks seems to stimulate the reaction of the tissues locally and to hasten resolution.

While the cause of cellulitis of the face and neck may be somewhat uncertain, its seriousness and possible fatality cannot be ignored. This condition seems to follow the introduction of certain organisms of high virulence into the deeper tissues. Since we do not know when these bacilli may be present, any operation which requires puncture of the oral mucous membrane should be preceded by a careful attempt at surface sterilization.

Because very little is written on this subject and since our experiences in its management are often quite different, it is hoped that criticism and discussion will be free indeed.

1610 Stroh Building.

DISCUSSION

J. H. Beckwith, Miami, Fla.: There has been a difference of opinion in regard to the midline incision over the point of swelling. Dr. Christiansen's experience has been mine in the few cases that I have had. I believe that every exodontist here has had cases of cellulitis which have caused him worry and study and anxiety. I was called in a case in which the patient's father had called in a physician. The infection was below the mylohyoid muscle. The physician was operating internally from the mouth. The patient, a young man, had six incisions with a drain trying to function from below the mylohyoid muscle upward. The tongue was pushed backward and terribly swollen, the whole floor of the mouth being involved. By making the external incision, we obtained excellent results. The temperature was 105.3 F. before the operation. That evening, it fell to 103.3, and the patient was able to sleep about seven hours. I am indeed glad that the importance of the external midline incision was stressed.

Howard M. Taylor, Knoxville, Tenn.: I have operated in about twenty to twenty-five cases of cellulitis, and, in all but one, there were colon bacilli present. I would like to have Dr. Christiansen tell me just how or whence this bacillus came. We know that it is not usually found around the mouth and in the neck. I would like to know whether there

is any direct connection with the infection in the mouth and neck and the usual location in the colon. In an acute pericoronitis around a partially erupted lower third molar, with extensive cellulitis of the jaw and neck, would it be advisable to remove the tooth or treat it palliatively and remove it later?

E. C. Hume, Louisville, Ky.: In the true Ludwig's angina, we rarely have a definite abscess. Patients do not live long enough for the case to reach that stage. This is a well known fact. In a true Ludwig's angina, the clinical picture must be watched carefully, and what we do must be done radically and quickly, if we are to save the patient's life. When swallowing becomes difficult; the tongue becomes thickened and the tip turned up; the floor of the mouth becomes level with the occlusal plane of the teeth; the mucous membrane and edges of the tongue begin to fill in and take the form of the cervices of the teeth; the patient begins to speak with that extreme huskiness that is typical of Ludwig's angina and has that boardlike swelling so definitely characteristic of Ludwig's, there is a chill and then a rise of temperature, a drop, another chill, and then another rise. At this stage of the process, the temperature curve will flatten out, with little variation, usually, above normal. Something definite has happened. It has been brought out by some of the best investigators that, as these chills occur, there are new showers of bacteria thrown into the system. As long as the chills and fever continue, we are pretty safe, but when the temperature curve levels, what is to be done must be done quickly. Ludwig's angina does not form definite abscesses, but travels under fascia in the neck, and when it gets to a certain point, it begins to spread rapidly under the fascial planes and if something is not done at or before this state of the process or shortly afterward, all procedure will result in fatalities. I follow Blair's procedure, incision from the angle of the jaw to the midline of the neck and the midline down to the outer border of the swelling. The facial artery is not important in these cases. I open it wide and fill the wound with iodoform gauze. From twenty-four to forty-eight hours later, when the temperature begins to drop and other symptoms subside, I clip points with a skin clip or suture. A little later, I close a little more, to prevent a bad scar. If the process continues down into the mediastinum around the lungs or heart, an edema of the glottis develops. A supraclavicular incision from the sternocleidomastoid muscle almost to the midline is made. Iodoform gauze is left in place for seven or eight days, if necessary. I inject into the iodoform gauze as I would into the tissue 2 per cent of iodin or metaphen. If we inject and leave the gauze alone, we block this plane at this point and still have a chance to obtain drainage above and possibly save the patient. Tracheotomy is sometimes admissible. An important point in connection with these cases is the time of incision. I would rather make the incision before there is definite pus formation. In connection with the fluid that comes from this incision, smear and culture should be made. In three instances, we were able to find Vincent's organism. In an article appearing about three years ago in the *Journal of the American Medical Association,* some cases were reported in which it was said that Ludwig's angina was due to Vincent's organism, or at least that was the opinion of the author. In the three cases that I mentioned, in which Vincent's organisms were found, arsphenamin was given intravenously while the patient was on the table, and, in forty-eight hours, there was marked improvement. All made rapid recovery. If we wait for definite formation of pus in a true Ludwig's angina, we lose valuable time and possibly our patient. There are different types of cellulitis, but Ludwig's is the one which we are discussing. I have had relatives refuse to let me do what was necessary, until the patient was practically dead. On observation at the postmortem, the mediastinum was filled with the fluid. Had I a case of Ludwig's angina today, I would want someone to start at the angle of my jaw and go to the midline, pull the corners back and "fluff" it full of gauze, leaving it wide open. As far as the facial artery is concerned, I have no more fear of injury to it than injury to the mandibular. I make a wide incision before pus is formed and leave it wide open. In two or three days, with a little nitrous oxid if necessary, sutures can be put in. The great mistake with most of us and the physicians is to fail to recognize the serious import of a case when any tooth in the mandible forms an abscess that burrows through the lingual plate of bone. The average gunshot wound through the face is not half so dangerous as the pus burrowing from a tooth through the lingual plate of bone and beneath the deep fascia of the neck.

Theodor Blum, New York City: What I would like to know is: what is cellulitis? If

we speak of inflammation or infection of the neck and wish to use that term for all inflammation, very well. But it does not mean anything. We may as well use any general term. We may call this inflammation of the cellular tissue. If my memory serves me well, the term "cellulitis" more or less applies to a distinct condition, and that is Ludwig's angina. The description of Ludwig's, as Dr. Christiansen gave it to us, and the description of the cases do not coincide. These are two entirely different things, in my opinion. While I have seen quite a number of cases of Ludwig's, I do not care to see any more because, in all my cases, it meant signing a death certificate. I do not believe that we can cure a case of Ludwig's angina. We have to do everything that we can to help these patients, but I do not think that we can do much at present. What is the condition in the cases which Dr. Christiansen has described? If pus forms in the lymph glands, I speak of purulent lymphadenitis; if in the submaxillary glands, I speak of submaxillary lymphadenitis. If pus develops under the lingual periosteum, the condition is a purulent periostitis, but that is not cellulitis. Cellulitis occurs in any inflammation, no matter where it is. It cannot possibly be confined to the periosteum: the overlying structures must be involved. If we wish to be a little more definite and understand each other a little better, I think we should use terms which are indicated for certain conditions with which we are dealing: a peritonsillar abscess, periostitis or a Ludwig's angina. I cannot see the advantage of a midline incision, except when it is supposed to be there. There are certain laws for incisions. We know the incision should be at the highest point of the swelling, at the most sensitive part, and certainly at the point where we expect to find pus closest to the surface. If I can, with an incision in the submaxillary region, obtain pus by going into the tissues, probably 0.5 or 1 cm., is it the right and proper procedure to make an incision in the median line and back? But there is a distinct indication for an incision in the median line, first of all, if we have the pus there, and, secondly, if we do not know whether the pus is on the right or the left side. If the entire mouth is swollen and edematous, and we cannot make up our minds on which side the pus is, it is always best to make a midline incision and explore both sides, then run the incision across the affected side. I feel, as does Dr. Hume, that if we are dealing with a case of Ludwig's angina, we have to incise without waiting for pus formation. We must lay everything open and pray, or do something like that. On the other hand, if there is no fluctuation, and there is not always fluctuation, as the pus may be very deep, we have to be guided not only by the blood picture but by the pathologist's interpretation of the blood picture. As we do not know everything about pathology, we always like to have help. The temperature, of course, will give additional information. Then there are cases in which we incise even if we do not have the ordinary clinical indications for incision. In the so-called infected third molar pocket, I believe it is the greatest mistake to incise the soft tissues over a partially erupted tooth. If I think pus has collected, I treat it as I would an abscess in any other place, making an incision and draining the pus. We can rely a great deal on Nature, and if we incise these soft tissues, we hamper Nature in everything that she is trying to do for us. I had a case last winter in which this was done and a fatal osteomyelitis developed. It was something that was entirely unnecessary. Therefore, I think that if there is an acute inflammation of an infected third molar pocket, we should treat the condition until it becomes chronic and then do what is necessary.

Boyd S. Gardner, Rochester, Minn.: One of the important ideas that we should get from Dr. Christiansen's paper is to prevent the conditions to which reference has been made. We should bear in mind that these unfortunate results generally obtain from the extraction of mandibular molars. Therefore, when several teeth are to be extracted, especially in patients showing lowered resistance, a test should be made by the extraction of a maxillary tooth to determine the reaction which is apt to take place. This we believe to be good practice in patients who are not in good health and who give a history of unsatisfactory results from previous extractions. I would like to have Dr. Christiansen say something more regarding the application of heat; as to how he applies it and for how long. We apply heat inside and outside. We use irrigation within the mouth by letting hot water run in and out. Moist heat is applied to the outside. Another thing: we should bear in mind that when eruption of a mandibular third molar or the extraction of an impacted mandibular third molar results in swelling and trismus, we should be sure that

we are not dealing with actinomycosis. At the first opportunity, an examination should be made to rule out this disease. Otherwise, we may have complications, the result of which may be unfortunate.

Dr. Christiansen: I wish to repeat that I have tried to avoid in this paper the discussion of cellulitis outside our particular field. A review of the literature pertaining to cellulitis will reveal cases of meningeal involvement and deep cellulitis of the neck, where the supraclavicular incision was necessary; but that is not our territory. We are particularly interested is the formation of pus between the muscles of the floor of the mouth and in the subparotid region. If pus lies superficially and there is fluctuation, naturally incision should be made at that point. As I have said, where possible, and where desirable a midline incision should be made, not otherwise, and I do not believe a deep incision is necessary if pus is near the surface. In many cases, pus is not in the superficial tissues and it is necessary to go deeper. The only place that we can incise deeply with freedom is in the midline. I try to avoid the locality of the facial artery. Severe inflammatory changes may injure the walls of this vessel and the safest plan is to keep away from it in drainage procedure. There is a distinct difference between results from mouth conditions and in those involvements which develop in the region from the thyroid cartilage downward. Ludwig's own description makes no mention of recoveries. He states that patients were very sick a certain number of days and then died. At the present time, that is not so. Coakley definitely differentiates the two conditions and cites cases in which tracheotomy was necessary in laryngeal edema. The need for this does not occur in submaxillary facial edemas. Free incision before localization is permissible only when pressure on the tongue is sufficient to cause extreme difficulty in breathing. If such a condition develops then, as Blair and Ivy say, a deep midline incision should be made so that the tension of the swollen tissues may be reduced. If this emergency step is not taken, the patient's chances for recovery are decreased. The presence of the colon bacillus in pus from facial cellulitis is not hard to explain when we realize how widely this organism is distributed. Cellulitis is an inflammatory condition of the cellular tissues, no matter where it is. It does not necessarily have to be in the face. I said that in all large facial abscesses we certainly should not say that the condition is cellulitis, which is a generalized inflammatory process that does not point as a facial abscess does. When a breaking down occurs, drainage should be established. At this point, judgment is required as to when to incise. As to the treatment of partially erupted teeth, I feel that such teeth should be let alone if there is an acute inflammatory process. The procedure should be treatment to reduce this inflammation before any operative work is attempted. Hospitalization is almost always necessary and data on blood chemistry are best obtained from the laboratory. Blood cultures in these cases failed to show organisms in the blood after chills, and, as Dr. Hume has brought out, they are probably due to bacterial showers. If the patient lives long enough, the condition will improve, there will be localization and it will be possible to obtain drainage. Mention of the presence of Vincent's organism in the cases cited by Dr. Taylor is very interesting. I can easily see why almost any mouth organism might be found in pus from areas around the third molars. My impression of the danger of sinus thrombosis is that premature opening of any lesion in the upper lip or around the sides of the nose or the tissue under the eye may result in rapidly developing septicemia and probably death. The use of heat should receive a great deal of consideration. If the face is enlarged enormously and the skin is red, shiny and extremely sore, heat is contraindicated. If the mass is hard and if the pain is not great, hot compresses probably will help. If a peritonsillar abscess is developing simultaneously, a hot soda douche with the fluid directed against the inflamed part of the throat will usually hasten the pointing process. I wish to repeat that a peritonsillar abscess and a cervicofacial cellulitis frequently coexist. If drainage of the extra-oral condition is to be carried out under general anesthesia, the mouth must be forced open to permit an intra-oral examination. As pus from a ruptured throat abscess may cause severe pulmonary complications, prevention of such an accident demands primary investigation. The distinction between cellulitis *per se* and Ludwig's angina is difficult; certainly there is an overlapping. Perhaps, as Dr. Blum suggests, if the patient dies the malady was a true Ludwig's; if not, it was probably a cellulitis.

OPERATIVE RESTORATION OF THE TEETH IN RELATION TO ADJACENT TISSUES*

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THERE is no operative procedure on the teeth which does not have a relation, either direct or indirect, to the adjacent tissues. The term "adjacent tissues" suggests the gums and the pericemental membrane, although such structures as the tongue, salivary glands and tonsils may be included in a sweeping definition. As the pericemental membrane and the gingival tissues are more directly affected by operative restoration, I shall confine my remarks chiefly to those procedures which have a bearing, either direct or indirect, on those particular tissues. The welfare of such tissues always should be considered in any type of operative restoration.

The pericemental membrane is that tissue which fills the space between the surface of the root of a tooth and the wall of its alveolus. It is attached to the cementum of the tooth on the one side and to the periosteum of the bone on the other. The attachment of this fibrous connective tissue membrane to the tooth and the wall of the alveolus is effected by Sharpey's fibers, which become embedded or calcified in the cementum and in the bone. The pericemental membrane, which is of connective tissue origin, is developed from the inner and outer layers of the embryonal dental follicle. Histologically, it consists of the predominant white fibrous connective tissue and of blood vessels, nerves and lymph vessels. Four types of connective tissue cells are present: fibroblasts, cementoblasts, osteoblasts and osteoclasts. The fibers are of two general types: the principal fibers, which attach the tooth to the socket, and the indifferent fibers, which form a fibrous bed for the blood vessels and nerves. According to G. V. Black's classification, the principal fibers are divided into six groups, named according to their location and point of attachment. They are:

1. The free gingival group. These arise at the neck of the tooth and are inserted in the gingivae.
2. The transseptal group. As the name implies, fibers of this group pass across the septums and attach themselves to the neighboring teeth in the arch. These fibers are inserted in the cementum of the tooth root.
3. The alveolar crest group. The fibers pass obliquely downward from the neck of the tooth and attach themselves to the crest of the alveolar wall. They serve to hold the tooth down in its socket.
4. The horizontal group. These fibers pass horizontally from the occlusal third of the alveolar wall to the cementum.
5. The oblique group. These are attached to the middle third of the alveolar wall. The fibers are directed obliquely downward toward the tooth root. The downward stress of mastication falls principally upon this group.
6. The apical group. This group surrounds the apex of the tooth root and is attached to the bottom and lower sides of the tooth socket.

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The pericemental membrane serves several functions in addition to that of nutrition of the tooth. It is a sensory organ, conveying the sense of touch or pressure to the central nervous system. It serves the mechanical function of retaining the tooth in its socket, and acts as a cushion between the root of the tooth and the wall of the alveolus. It also attaches the gingivae to the neck of the teeth.

The gingival tissues consist of stratified squamous epithelial cells resting upon a connective tissue stroma. These squamous cells are arranged in irregular rows, there being from about fifteen to thirty rows of cells in the epithelium. The color of gum tissue is due entirely to the vascularity of the connective tissue stroma beneath, which shows through the epithelium. Where inflammation is present in the tissue, there is increased vascularity in the subjacent connective tissues and the gum assumes a red appearance. There is some normal variation in the color of the gums in different individuals, and a normal variation in the color of the mucous membranes of a mouth. The epithelial covering of all tissues serves as a protective membrane. The epithelium of the mucous membranes is not nearly so thick as that of the epidermis; hence, the tissues of the mouth are particularly susceptible to infection and injury, and in all operative restoration, care must be taken to preserve them in a state of health.

In operative procedures, one should carry in mind the ideal restoration. Such a restoration should reproduce the anatomic form of the tooth. The chemical composition should cause no injury to the oral tissues, and the function should coincide with the function of normal tooth structure. Such a restoration involves conscientious and meticulous workmanship, and it is particularly important that special attention be given to restoration of those parts which have the most direct bearing on the health of the contiguous tissues; namely, the inclined planes of the cusps, the gingival margin and the contact point. In my discussion of operative procedures in this paper, I shall give these things special attention.

The five most common types of fillings used in the mouth are: the gold inlay, gold foil, amalgam, silicate and the porcelain inlay.

GOLD FOIL

In discussing operative procedures with relation to the health of adjacent oral tissues, it must be remembered that extensive caries in the mouth may cause a lowering of resistance in the mucous membranes and render those tissues particularly susceptible to bacterial infections. This is especially true with infections such as Vincent's. Any filling material, therefore, which by reason of its efficiency tends to inhibit caries more than does another deserves the careful consideration of the operator. When such material is used where it is indicated and the value derived from it is not nullified or lessened by other weaknesses inherent in the material, the operator is justified in his use of it. Gold foil, as a metal, is unsurpassed as a filling material. It fulfils all of the qualifications of a satisfactory filling material, which, according to Dr. Black, are (1) indestructibility in the mouth; (2) adaptability to cavity walls; (3) freedom from shrinkage or expansion after being made into fillings, and (4) resistance to attrition and the force of mastication.

There is no other filling material more highly adaptable to cavity walls than gold foil properly condensed, for with no other filling material can the elasticity of the

dentin be taken advantage of. It neither shrinks nor expands. Once it is properly malleted into a cavity and the cavosurface angles are properly protected, there is absolutely no danger of recurrence of caries. But foil, like every other material, has its drawbacks, and these must be kept in mind by the operator. Among its minor disadvantages are conductivity. It ranks third in this property, being exceeded only by silver and copper. For that reason, it should not be placed in excessively deep cavities, as it will conduct thermal shock to the pulp. The chief objection to gold foil lies in the fact that the average operator is unable to reproduce successfully the inclined planes of the cusps of the teeth; whereas, he is able to do this with the gold inlay. I shall endeavor to point out later how the proper contouring of grooves, contact points and cusps is of vital importance in preventing the packing of food, which may cause disease and disintegration of the pericemental membrane. There are certain other precautions which must be observed in contemplating gold foil as a filling material. It should never be inserted in a tooth when its pericemental membrane is inflamed. Also, it is inadvisable to place it in the mouths of young children. The force necessary for condensing gold irritates the tooth pulp. The pulps of very young teeth are particularly susceptible to irritation of any kind, and react more intensely to pressure than more mature teeth.

There should be special caution in forming the gingival margins in gold foil restoration of the teeth of young patients. We all know that, as age advances, the amount of tooth structure which shows above the gum line increases. In pathologic conditions, this increased exposure of tooth surface is caused chiefly by shrinkage of the gingival tissues in periodontoclasia. The same phenomenon occurs where periodontoclasia or disease with similar effects is not present. In other words, it is a normal physiologic process. In the normal condition, the exposure of tooth surface is not the result of shrinkage or drawing away of the gum tissues. It is explained by the fact that the growth of cementum is a continuous process throughout the life of the individual. The cementum-depositing cells, the cementoblasts, continue to lay down cementum around the root of the tooth, particularly in the area of the bifurcation of the roots and around their apices. As age advances, the pericemental membrane becomes smaller and smaller, owing to the encroachment of the cementum in the space formerly occupied by the membrane. This continuous growth of cementum gradually elevates the tooth from its socket. In very old individuals, this extrusion is quite prominent. This process serves the function of advancing the teeth into occlusion as abrasion on their grinding or incisal surfaces takes place. This normal extrusion of the teeth gives the gum the appearance of having shrunk from them, when such is not the case.

In the mouths of very young persons, if gingival margins of gold foil fillings are not placed well under the gum tissue, in a few years the margins may have receded some distance above the gingival line into the interproximal space. They are then deprived of the protection of the gingival tissues, and caries is likely to recur.

AMALGAM

From the standpoint of the health of the adjacent oral tissues, one of the most important features in any restoration is the contact point. Compared with cast gold, amalgam is an unstable material. Since contact points must be effected in

proximal fillings, amalgam should be used sparingly for proximal restorations. No matter how well condensed the contact point may be, it is only a question of time before the contact between the two teeth will wear. This wearing of the amalgam results in the formation of an unprotected interproximal space. Inevitably, food packs result, and inflammation of the pericemental membrane follows. With the wearing of the contact points, a certain amount of drifting ensues, causing contact points of other teeth to be impaired. It must be borne in mind that a faulty contact point is not an evil that necessarily confines itself to the teeth involved. Other teeth may be indirectly affected, and often are. Amalgam, where indicated, is a most satisfactory filling material. It serves very well in portions of teeth not subjected to stress, such as the lingual and buccal surfaces of posterior teeth. Amalgam possesses mild antiseptic properties, due to its silver content. This, of course, is a minor advantage.

While it must be admitted that, in the construction of durable contact points and gingival margins, amalgam suffers in comparison with other filling materials, it must also be conceded that the inefficiency associated with amalgam restorations is attributable largely to the inefficiency of the dentist. Like all other filling materials, it has its disadvantages, the particular ones being its color, poor edge strength and tendency to flow under stress. But, in a simple cavity, where it is particularly indicated, it proves to be a most valuable filling material. Amalgam should not be condemned because, in the past, dentists have been careless in manipulating it and in preparing cavities to receive it.

Most of the failures of amalgam fillings are due to faulty manipulation of the material. A large number of the failures result from faulty cavity preparation. Under faulty cavity preparation may be mentioned the following: (1) negligence on the part of the dentist in carrying out the steps of cavity preparation, particularly the correct beveling of the cavosurface angles; (2) carelessness in removing all the caries from the cavity, attributing to the amalgam more antiseptic action than it possesses. There is an impression among a great number of dentists that the beveling of the cavosurface angle of cavities intended to receive amalgam is not necessary. Nothing could be farther from the truth. For amalgam, the angle of the bevel should be the minimum, and the involvement of the rods of the enamel should be the maximum, the body of the material being thus utilized as support to edge strength. To say it in a different way: the bevel should be long, but not at a great angle. In certain instances, it may involve not only the entire enamel wall but a portion of the dentin as well.

Under faulty manipulation of the material may be mentioned: (1) neglect to use the rubber dam; (2) improper mixing of the mercury and the alloy; and (3) insufficient pressure in packing the amalgam into the cavity.

SILICATES

Next to cement, silicate is the poorest filling material. Were it not for its obvious advantage of color blending, it would not be used in the mouth. It is not impermeable to the fluids of the mouth. It will stand practically no stress; hence, it can never be used where the force of mastication is brought to bear directly upon it. It suffers greatly as a filling material when compared with amalgam, gold foil and gold inlays. Also, it has been claimed that silicates are often responsible for the death of tooth pulps.

GOLD INLAYS

The greatest advantage of the gold inlay is the apparent ease with which occlusal surface carvings and contact points can be made. Dentists do not give enough attention to the fine points of their work. The presence of incorrectly carved inclined planes, marginal ridges and gingival margins often results ultimately in the production of food packs and in periodontoclasia. There are four criteria by which we may judge the efficiency of a restoration. An operator should ask himself these questions: 1. Does the filling restore the masticatory efficiency of the tooth and protect the pulp? 2. Are the inclined planes, grooves and marginal ridges so carved that wedging of food material in the interproximal spaces will be prevented? 3. Are the contact points correctly carved and normally placed? 4. Do the gingival margins cause any infringement on or irritation of the gum tissues? A filling satisfying these requirements will be worth while.

Food impaction may occur in two ways: food may become wedged between the teeth from an occlusal direction, or it may become wedged in the interproximal spaces from a buccal or lingual direction. The first cause is by far the more common and is the more serious. Food débris which enters the interproximal spaces from a buccal or lingual direction usually can be removed by the judicious use of the tooth brush. The removal of a food pack resulting from a faulty carving of marginal ridges, inclined planes and contact points is not so easily effected, and the condition will exist until some means is taken to restore the inclined planes, marginal ridges and contact points to their normal condition.

Dr. Hirschfeld[1] gives one of the most complete expositions of food packs that it has been my pleasure to come across. In his most thorough analysis of this condition, he lists twenty ill-effects attributable to the presence of food packs.

1. Discomfort caused by interproximal pressure and pressure against the septal tissue.
2. Local pain caused by superficial and deep proximal cavities.
3. Neuralgic reflex pains at more remote points.
4. Chronic hypertrophic gingivitis.
5. Hemorrhage.
6. Susceptibility of septal tissue to acute infection, through lowered resistance.
7. Alveolar and gingival recession.
8. Chronic pericementitis.
9. Acute pericementitis.
10. Elongation of the tooth.
11. Drifting.
12. Traumatic occlusion.
13. Suppurative periodontoclasia.
14. Local acceleration of existing periodontoclasia.
15. Retardation of progress in treatment of periodontoclasia.
16. Root exposure.
17. Hypersensitiveness of the root surface.
18. Presence of deep, cervical, proximal caries frequently overlooked until it is too late and usually very difficult to mend.
19. Probable infection of the pulp, and serious local or systemic consequences.
20. Loss of tooth.

With reference to the form and position of contact points and marginal ridges, Diamond's "Dental Anatomy" says:

> The marginal ridges are definitely designed to stand guard against the impaction of foods in the interproximal spaces. Rolled over toward the occlusal surface and slightly elevated above the central groove, their function is to keep the foods within the area of the occlusal surface, very much as the rim confines the contents of a saucer. The tendency is to place them too high in relation to the summits of the cusps, shortening the arms of and limiting the action of the cusps, which bear the entire brunt of the function of mastication. Their positions, however, can be definitely determined. The marginal ridges are no more than a millimeter oc-

1. Hirschfeld, Isador: Food Impaction, J. A. D. A., 17:1504 (Aug.) 1930.

clusally above the central groove, which is the depth of the cusp. The point of contact in the region of the widest mesiodistal diameter is slightly cervically below the depth of the cusp. The distance between the point of contact and the marginal ridge is on the lesser side of two millimeters, with the depths of the cusps lying on a plane about midway between the two. The marginal ridge lies on a plane in between the depth of the cusp and the summit of the cusp, but close to its depth, with the summit of the cusp reaching generously about it.

The operator must bear in mind that the contact point differs in location and in form according to the position of the teeth in the mouth, i. e., whether they are posterior or anterior teeth. The contact point of a thick-necked molar tooth would of course differ from that of a normal molar tooth. Normally, the contact point may be compared with the touching of the rounded surfaces of two marbles placed together. In thick-necked teeth, the point of contact would be broadened in all directions. In normal teeth, generally speaking, the contact point of posterior teeth is located at the junction of the middle with the occlusal third of the proximal surface and in anterior teeth, at the junction of the middle and incisal thirds. In the anterior teeth, labiolingually, the contact point is lingually from the center of the proximal surface, while in the posterior teeth the contact point, buccolingually, is buccally from the center of the proximal surface. To state it differently: In the anterior teeth, the labial embrasure is greater than the lingual; while in posterior teeth, the lingual embrasure is greater than the buccal.

In anterior teeth, the contact point often tends to deviate and become a line contact in a vertical direction. In posterior teeth, when a contact tends to become a line contact, as is sometimes the case, the line is formed in a horizontal direction, the reverse of the tendency to line formation in the anterior teeth. All contacts tend to broaden and become surface contacts in time, owing to the mobility of the teeth, just as constant friction upon any rounded surface tends to flatten it. This must also be borne in mind by the operator.

The explanation as to how food packs from an occlusal direction occur and how increased interproximal spaces result is rather complex in all of its details. Generally speaking, the inclined planes of the cusps of the opposing teeth churn the food in the concavity formed by the marginal ridges, grooves and inclined planes of the antagonist. When these marginal ridges are well formed, they prevent the food from being directed toward the interproximal space, giving it instead an occlusal direction. When these marginal ridges are missing because of attrition in the natural teeth or careless workmanship in restorations, the food is not directed away from the interproximal spaces but is rolled into them. This constant packing of food in the region of the contact point finally results in forcing the teeth apart and in separating the contact points. When that condition exists, the food becomes packed against the septal gum tissue. The evil effects of these food packs are much greater than most dentists realize. Numerous cases have occurred in practice where a food pack has caused acute pain, oftentimes so intensive as to make the dentist and the patient suspect that the pain came from the pulp of the tooth. With the correction of the marginal ridges, inclined planes and contact point, the pain immediately disappeared.

Dentists themselves are often responsible for the production of food packs. There is a tendency in carving the inlay wax pattern to make the cusps of the teeth too sharp and pronounced. If they

are made too long or too sharp, the space between the point of the plunger cusp and the concavity bounded by the marginal ridge, groove and cusp in the opposing tooth is diminished. With this diminution of space, the plunger cusp exerts a greater force and the food has a greater tendency to roll over into the interproximal space, especially if the marginal ridge of the tooth receiving the force of the cusp is inadequate and unable to direct the food occlusally. In the carving of inlays or in the building of inclined planes into the occlusal surface of any kind of restoration, cusps should be carved or shaped no higher, lower or broader than the normal measurements of other similar teeth in the mouth. It is obviously illogical to make high cusps and steep inclined planes in the occlusal surface in a restoration when the other teeth in the mouth may be worn flat or nearly flat by the forces of mastication. Dental students are particularly prone to this error, and often present to the instructor, for his approval, gold inlays esthetically carved and beautifully inefficient. Again, food packs may be caused by the dentist's failure to make any attempt at anatomic restoration of the marginal ridge.

There are numerous factors in the formation of food packs. It would be beyond the scope of this paper to mention them in detail. The outstanding causes are: (1) attrition of the occlusal surfaces of teeth; (2) loss of proximal support; (3) extrusion of teeth; (4) congenital malformations, and (5) improperly constructed fillings, crowns, etc.

SERIOUS PATHOLOGIC CONDITIONS RESULTING FROM INEFFICIENT DENTISTRY

Carcinomas and sarcomas frequently have their origin in tissues irritated by faulty dental work. The presence of badly fitting crowns, overhanging gingival margins in inlay and amalgam restorations and sharp surfaces of broken down and neglected teeth may cause epithelial and connective tissue neoplasms, resulting ultimately in the death of the patient. Papillomas and fibromas of dental origin are very common. Fibromas may result from the presence of ill-fitting plates, bridges, open contact spaces in teeth and cavities under the gingivae concealed by food packs and therefore often undetected by patients. How many fibromas of the mouth have you observed which were not located between the teeth? Radicular cysts may result from chronic irritation of the pericemental membrane by food packs and overhanging gingival margins of fillings.

Inefficient dental restorations play an important role in the production and maintenance of Vincent's infection. It is very rarely that Vincent's infection occurs in edentulous mouths. The organisms of Vincent's infection, the spirochete and the fusiform bacillus, are anaerobic; hence, sheltered areas such as those afforded by overhanging gingival margins and food packs offer an ideal place for their incubation and growth. Any practitioner will have noticed that Vincent's infection occurs most commonly in those mouths which show the least hygienic care. Not always is the patient fully responsible for such a condition. In our dental practices, all of us have seen mouths of patients in which there is a riot of battered amalgam fillings with gingival margins overhanging 2 or 3 mm. beyond the proximal surfaces of the teeth, inlays with no gingival margins and the cement dissolved out and gold foil fillings almost soft enough to shape with the fingers. When a patient with such dental work becomes infected with Vincent's

organisms, the complete eradication of the infection is not possible until the faulty work has been corrected. One may treat the disease to a point where there are no gross manifestations of its existence, but the organisms will remain in these sheltered places and eventually cause a reinfection. We know that Vincent's infection frequently has its beginning under the overlying flaps of third molar teeth where the organisms are protected from free oxygen. It is no less plausible that overhanging gingival margins of fillings, etc., and food packs due to faulty contact points may offer as favorable an environment for the growth of these micro-organisms.

One of the greatest deficiencies in American dentistry lies in the profession's lack of appreciation of the subtleties of operative procedure. Most dentists do not realize the tremendous importance of correct contact points, gingival margins and correctly constructed occlusal inclined planes. Very few dentists give attention to the prevention of trouble in the adjacent tissues. They become conscious of the ill effects of disease of the oral tissues only after it has actually developed. Most dental operations are routine in character. A dentist should have somewhat the attitude of the artist in his work. Fine conception and subtlety of technic can raise a painting from the status of a mere picture to that of a creation of genius. Likewise, a consciousness of the general health of the individual and meticulous attention to the fine points of dental restorative work will raise the dentist from the status of a mechanical worker to that of a skilled guardian of the health.

106 Forrest Avenue.

PROMOTING NORMAL DEVELOPMENT BY MAINTAINING THE FUNCTION OF THE DECIDUOUS TEETH*

By O. W. BRANDHORST, D.D.S., St. Louis, Mo.

MUCH time and thought has been devoted to the subject of the development of the norm, and we are learning, although slowly, more and more about the conditions that influence growth and development.

It is pleasant to picture the day when we can control all abnormal influences and divert them to aid, and not hinder, in the production of Nature's masterpiece. But in the complexity of these accomplishments, we are prone to lose sight of the more common influences toward abnormality, because they are so near at hand.

In order to have normal development, all forces affecting such development must be working in harmony. Nature's struggle is to reach maturity without a handicap, and it is our duty to remove all interference as nearly as we can.

Growth and development normally go on uninterruptedly from childhood to maturity, though periodically retarded

*Read before the Section on Orthodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

or accelerated in certain parts, and this applies to the face and jaws as it does to other parts of the body.

Keith and Campion[1] have shown this process of growth and development of the face rather beautifully by superimposing the sagittal section of the head of a 5-year-old child upon that of an adult of 25. (Fig. 1.) The great amount of change in all directions during this period is evident.

Hellman,[2] in an article on the development of the face, has approached this study from another angle. He has, for

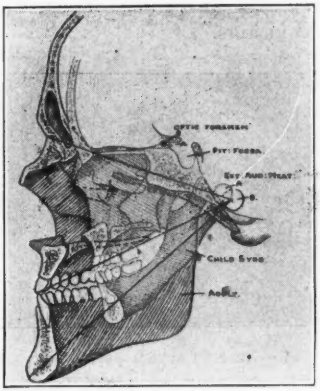

Fig. 1.—Sagittal section of head of 5-year-old child superimposed on that of adult aged 25.

convenience, divided the process into seven stages as follows:

Stage I. Early infancy—before completion of deciduous dentition.

Stage II. Late infancy—at completion of deciduous dentition.

Stage III. At eruption of first permanent molars; some of the deciduous teeth replaced.

Stage IV. Pubescence—second permanent molar erupted and all deciduous teeth replaced.

Stage V. Third molar erupted.

Stage VI. Old age and worn surfaces.

Stage VII. Senility—half of crowns worn off and some lost.

Our interest at this time being chiefly in the deciduous arch, attention is directed especially to stages II, III and IV. Hellman states that from Stage I to Stage II, that is, from early infancy to the period of a complete deciduous arch, there is an increase in the facial height of 17 per cent; from this period to the next, or to the time when the first permanent molar has erupted, and some of the deciduous teeth have been replaced by permanent ones, there is an additional

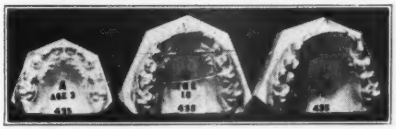

Fig. 2.—Dental arches at different ages.

increase of 14 per cent. Further, from this stage to stage IV, when the second permanent molar has erupted and all deciduous teeth have been replaced, there is an increase over the previous stage of 24 per cent. In other words, during this period of development, from infancy to the time of a permanent arch, there is an increase of more than 50 per cent in the height of the face (nasion to menton).

No other period thereafter shows a like increase, and it is therefore logical to assume that influences tending toward normal development are most active during this period.

Let us now examine the maxillae of a child to ascertain, if possible, what takes place there during this period of devel-

1. Keith, Arthur, and Campion, G. G.: Contribution to Mechanism of Growth of the Human Face, Internat. J. Orthodontia, 8:607-633 (Oct.) 1922.

2. Hellman, Milo: Preliminary Study in Development as It Affects Human Face, Dent. Cosmos, 69:250-269 (March) 1927.

opment. Figure 2 represents the dental arches at various ages, *A* representing the period at 3 years of age, soon after the deciduous teeth have all erupted; *B,* the stage at about 10 years of age, when the deciduous central and lateral incisors have been replaced by permanent ones, and the first permanent molars are in position, and *C,* the same arch when all deciduous teeth have been replaced (at about 12 years of age).

If we measure the width of these arches, using identical points, we find that there has been a material increase in lateral development.

Now let us obtain the distance from the distal aspect of the deciduous second molar on one side to the same point on the other, by summing up the mesiodistal

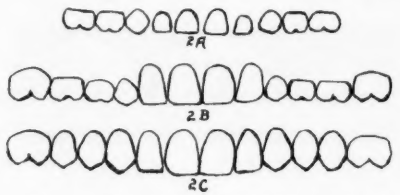

Fig. 3.—Comparison of spacing of teeth at different ages.

diameters of the molars and anterior teeth, in each of these arches. (Fig. 3.)

In *2C,* the identical points should be the mesial surfaces of the first permanent molars and the mesiodistal diameters of the bicuspids and the anterior teeth. We note that there is quite an increase in the circumference of the arches from *A* to *C.* In comparing the measurements of *A* and *B,* we also note that, in both of these, we are measuring the same deciduous molars and cuspids, so that any increase naturally must have occurred in the region of the anterior teeth, the other teeth not having changed in mesiodistal diameters.

Our clinical experience supports this, for we know that normally the permanent central and lateral incisors erupt before the permanent cuspids and bicuspids and that, for a period, we have a complete but mixed denture.

When we compare the measurements of *B* and *C,* we note that at this time the teeth in the anterior region, namely the central and lateral incisors, are identical but have changed in the bicuspid region.

From this, we can deduct that the following is Nature's plan in the development of these parts:

1. There must be a sufficient amount of space between the deciduous cuspids to accommodate the permanent central and lateral incisors.

Fig. 4.—Case in which permanent lateral incisors are erupting in lower jaw lingually to normal with insufficient space between permanent central incisors and deciduous cuspids.

2. The amount of space occupied by the deciduous cuspids and molars is Nature's provision for the bicuspids and permanent cuspids, augmented by additional growth possibly, but under no condition to be infringed on by other teeth.

Our task, then, is to aid Nature by maintaining this equilibrium above all things, and possibly the best way to sound a warning against neglect in this respect is to present a few cases that show the result of indifference in this matter.

In one of the first cases to present it-

self to us in the daily routine of practice, the permanent lateral incisors are erupting in the lower jaw, and are lingually to the normal, with insufficient space between the permanent central incisors and the deciduous cuspids (Fig. 4).

Being more concerned about the permanent teeth than the deciduous ones, the mother rushes to the family dentist for advice, and frequently the deciduous cuspid is removed to make room for the lateral incisor. This temporarily relieves the situation. About the eleventh or twelfth year, when the permanent cuspid tries to assume its allotted place in the arch, that space is already occupied, in

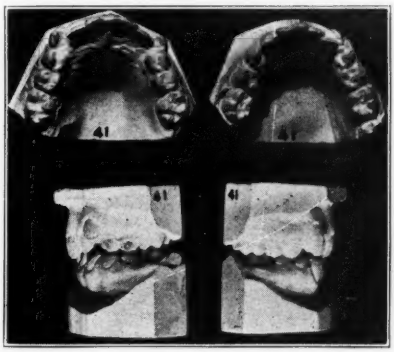

Fig. 5.—Malocclusion caused by extraction of deciduous cuspids to correct condition shown in Figure 4.

whole or in part, by the lateral incisors, and the inevitable happens—a malocclusion such as is shown in Figure 5. The good intent in extracting the deciduous cuspids has resulted in causing a malocclusion.

I have yet to see a case like the foregoing that has been improved by the premature extraction of the deciduous cuspid. Again, I have seen many cases adjust themselves and finally develop normally when extraction was not done. Certainly, the condition is never so bad without extraction as it is with it.

I do not wish to leave the impression that the extraction of a deciduous tooth to make room for a permanent one is never indicated. There are cases in which it is the thing to do, but it is seldom indicated in such cases as the one just outlined.

The most typical case coming to mind in which extraction is indicated is shown in Figure 6. Here, the deciduous second molar is still in position and is forcing the first bicuspid and cuspid mesially.

A too long retention of this tooth has a tendency to play havoc with the alinement of the teeth, owing to the fact that its mesiodistal diameter is greater than

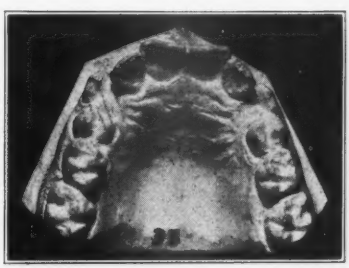

Fig. 6.—Case in which deciduous second molar is forcing first bicuspid and cuspid mesially, extraction being indicated.

that of its permanent successor, the second bicuspid. Judicious extraction of this tooth means much in assisting Nature's processes toward the normal.

I cannot refrain from sounding a warning here regarding the extraction of deciduous teeth without a preliminary roentgenographic survey to make sure that the permanent successors are present. It will save much embarrassment, to say the least.

Attention is also directed to the frequent displacement of the permanent teeth lingually, labially or buccally, due

to prolonged retention of their deciduous predecessors. Close attention and interest in normal development will do much to eliminate these conditions.

In order to promote normal growth and development of the face, every tooth should be retained its full span of time, but no longer, and during that period should have the advantage of its full anatomic form.

Why less interest should be manifest in the deciduous teeth than in the permanent ones is hard to understand.

Time was when we closed our eyes to them, with the remark, "They are only temporary"; but that time is past.

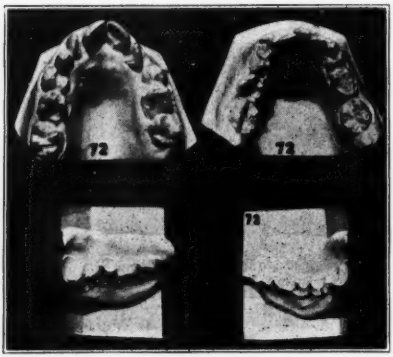

Fig. 7.—Case of girl, aged 8, in which decay in certain of the teeth has caused other teeth to shift out of normal position.

Today, in recognizing the many ill-effects of the neglect of children's teeth, the parents are asking, "Why does our dentist show so little interest in them?"

It behooves us, therefore, if we wish to maintain or better our position in the field of health service, to recognize our mistakes of the past and, to regain the confidence now rapidly slipping away from us, do our full duty to our patients in the care of the deciduous teeth.

Referring again to the measurements made of the arches in Figure 2, you will recall that the deduction was made that the distance between the distal aspect of the deciduous second molar and the mesial aspect of the deciduous cuspid must be maintained, if we wish to aid Nature. To have this encroached on means interference.

It is logical to conclude, then, that the teeth occupying this space should be kept in a healthy condition and their anatomic form rigidly maintained.

Figure 7 shows the casts of a girl about 8 years of age. The ravages of decay have played havoc with the teeth, destroying some partially, while one has been completely lost.

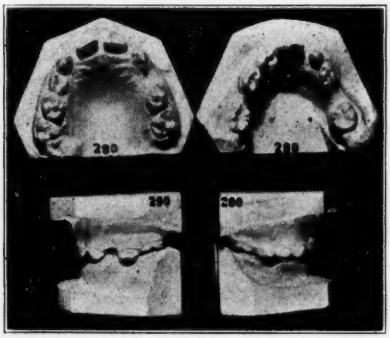

Fig. 8.—Case in which premature loss of a deciduous second molar has caused shifting mesially of first permanent molar.

It is not difficult to say what the outcome will be. Nature's processes have been interfered with and the chances are that she will never catch up. Owing to tooth destruction, the other teeth have shifted out of their normal position. Sore teeth and resultant systemic disorders have added to the condition and the child may become a liability to society instead of an asset.

The amount of disturbance in the development of the arch is directly propor-

tionate to the amount of tooth structure destroyed, reaching its height with the complete loss of the tooth. When, for instance, a deciduous second molar is lost prematurely, it does not require much time for the shifting mesially of the first permanent molar, as shown in Figure 8, to occur.

It is logical to assume that, under such conditions, the bicuspids must naturally deviate from their normal position. Figures 9-10 show typical results of such neglect.

If for any reason a tooth must be lost prematurely, we should take every precaution to prevent any disturbance of the

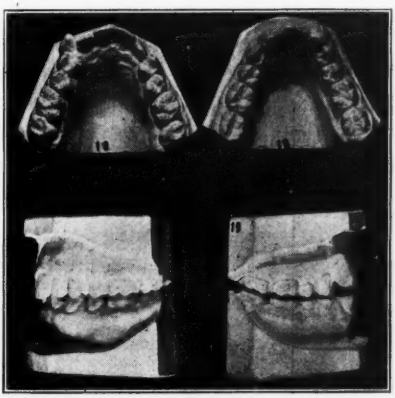

Fig. 9.—Typical result of deviation of bicuspids from normal position.

forces of normal development. Space maintainers should be placed to prevent shifting of the other teeth.

One of our greatest problems is to encourage attention to the deciduous teeth and maintenance of their normal mesiodistal diameters. This seems to be the greatest source of neglect. The apparent indifference of the family dentist toward caring for children's teeth results in a most pathetic situation. R. C. Willett, of Peoria, Ill., has suggested the most efficient ways of meeting this problem.[3]

With the increased activities everywhere, in public dental health education, and stressing of the care of the teeth, the dental profession can no longer ignore this great problem, but must set to work to remedy the situation and remove this blot from its fair name.

Statistics show that many children, in spite of the fact that they visit the dentist, have cavities that should be filled. Through dental examinations and health talks in the schools, pupils are urged to see the family dentist. Yet, on reexamination, they present many cavities in the deciduous teeth, still untouched. Does this make for confidence in our profession?

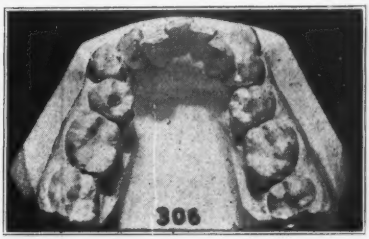

Fig. 10.—Typical result of deviation of bicuspids from normal position.

When we speak to the men who are devoting all their time to treating children's teeth, we are told that their support comes mainly from pediatricians and the laity, and very little from the dentist. Can we, under such conditions, expect to grow in the estimation of our medical brothers or in the respect of the public at large?

Perhaps you think the picture overdrawn. Go with me to the school in

3. Willett, R. C.: Intercepting Certain Types of Malocclusion, J. A. D. A. 16:389-494 (March) 1929.

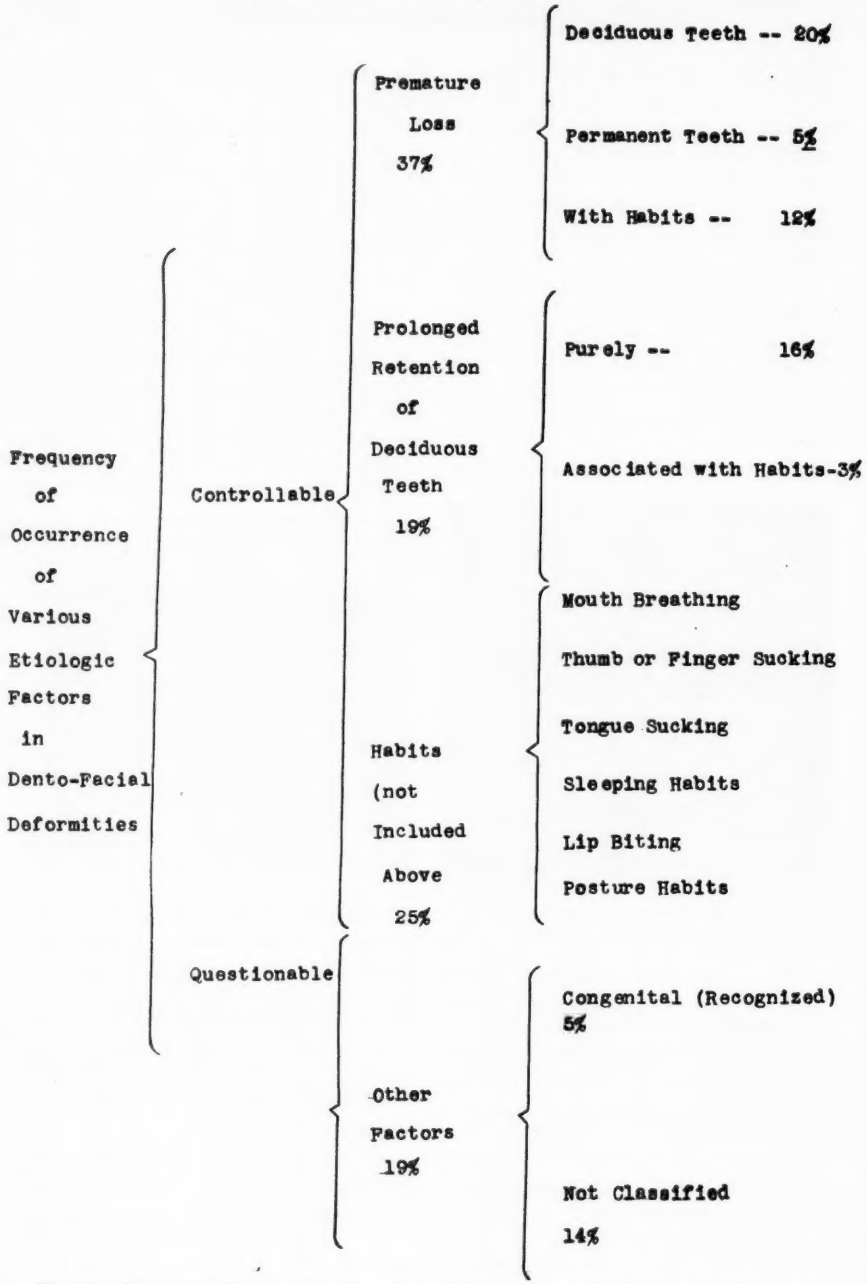

Fig. 11.—Frequency of occurrence of various etiologic factors in dento-facial deformities.

your community and examine the children in the upper grades as they come and go. Statistics have it that about 90 per cent of these children need dental attention, and that at least every other one, or 50 per cent, has a dentofacial deformity. Study these future men and women and consider our responsibility toward them.

Among them, here and there, are faces beyond repair, so far as human agencies go. Can it be that we did not do our full duty, and that this is the result of our neglect? Statistics show again that, of the deformities, three-fourths could have been minimized or even entirely prevented had proper care and advice been given at the right time.

Habits such as thumb sucking and tongue sucking usually assert themselves early in life, while mouth breathing, lip biting and sleeping and posture habits may develop at any time. Patients should be advised about the possible effects of these habits. If the family dentist does not do this, who will?

We realize that seldom are these habits operating singly. Usually, one is in combination with another or perhaps several others. Nevertheless, looking after one may minimize the deformity, and checking all of them will prevent it. Proper arch form and muscle function is essential to normal development.

The table shown in Figure 11 is significant. When we realize our responsibility in this matter, there is reason to shudder. We have been derelict in our duty and our obligation to the public. Think of it! About three-fourths of the abnormalities we see could have been averted if we had done what the public had a right to expect of us. As a profession, we must assume our full responsibility in prevention as well as in treatment.

What is the solution? Are we interested in our patient's welfare beyond the momentary return to us, and are we caring for every little detail, interesting ourselves in the deciduous teeth, as well as the permanent ones? Are we trying to aid in the normal development of the face by doing our full duty, including the giving of advice against habits that tend to interfere with Nature's processes?

When we can answer "Yes" without reservation to these questions, this great problem will be solved.

If we continue to plod along as we have been, we are not worthy of the responsibility. Think what it means. Ours is the responsibility for a normal development of the face, which is to become the source of pleasure or distress, joy or sorrow, not only to the individual himself, but also to everyone around him.

Promoting normal development by maintaining the function of the deciduous arch is the first step toward meeting the responsibility.

DISCUSSION

Frank F. Lamons, Atlanta, Ga.: Dr. Brandhorst's paper presents a phase of our work generally neglected by parents. The orthodontist does not as a rule see patients until after a malrelation or malposition is rather definitely established, and often such conditions are due to the premature loss of deciduous molars, notably around 4 or 5, before the parents have realized there was anything wrong with these teeth. Parents have not been fully educated to the importance of early care of the deciduous dentition. The orthodontist should feel it a part of his responsibility to aid in their education, by advising early and regular care of the first teeth.

THE PROBLEM OF HYPODERMIC NEEDLES BROKEN IN THE REGION OF THE MANDIBLE AND MAXILLA; REPORT OF A CASE*

By THEODOR BLUM, D.D.S., M.D., F.A.C.D., F.A.C.S., New York City

ALL operators who have been called on to take care of as many cases involving needle accidents as I have must agree that these cases are a problem from many viewpoints. For a number of years, I taught conduction anesthesia, and I am quoting below from articles written on this subject. I shall cite only the more salient points.

As early as 1914, I wrote under the heading "Dangers in Local Anesthesia":

As far as needles are concerned, I have never broken one. But never insert the needle into the soft tissues up to the butt, because—according to Braun—they break at this point. In case of such accident the needle can easily be removed.[1]

The subsequent quotations are taken from lectures given during a period of seventeen years.

In 1915:

We hear so much of late about broken needles, trismus, necrosis and pain after injection, etc. The average dentist needs practical instruction before using this method on private patients. . . . and—more deplorable and to be condemned—a great many men are teaching this subject without having had adequate instruction themselves and after having practiced conductive anesthesia for only a very short time.[2]

In 1916:

What dangers, if any, accompany a mandibular injection? None at all if performed correctly. Gentle manipulation practically excludes the possibility of breaking a needle; neither my assistants nor I have ever broken one.[3]

Again in 1916:

The introduction of conductive anesthesia has to a certain degree increased the number of accidents in dental practice. One case in particular I would like to mention. Mr. M. came under my care recommended by his dentist, who had broken off in the tissues a thin steel needle in attempting a mandibular injection. In my judgment his mistakes were the following: the use of conductive anesthesia without the proper study of the subject; the employment of a thin steel needle and of Fischer's technique of mandibular injection, which in my experience as a teacher is too difficult for the beginner; but his greatest and unpardonable error was to refer the patient to a dentist, who was not trained to do surgical work. To locate a foreign body at least two pictures at right angles must be taken, a fact which was neglected. The soft tissues anterior and internal to the ascending ramus were actually torn to pieces except in the region where the needle was. An incision was made at a right angle to the needle and the needle fortunately removed without much trouble.[4]

In 1918:

One must remember that the bony points alone are an absolute and sure guide for the needle, and that, therefore, the striking of the internal oblique line, the passing of the same

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 22, 1931.

1. Blum, Theodor: Local Anesthesia, D. Items Int., 36:185-210 (March) 1914.

2. Blum, Theodor: Technic of Conductive Anesthesia, D. Summary, 35:95-115 (Feb.) 1915.

3. Blum, Theodor: Mandibular Anesthesia, D. Cosmos, 68:1-12 (Jan.) 1916.

4. Blum, Theodor: Oral Surgery with Special Reference to Difficult Extractions, D. Items Int., 39:641-669 (Sept.) 1917.

and the sliding along the inner aspect of the ascending ramus are absolutely essential. When following out this principle, the syringe will practically never cross the median line and surely never rest on the cuspid or bicuspid of the opposite side. To my knowledge, a needle has never been broken when using this method, while during the last year I had at least six cases of broken needles under my observation, the x-ray examinations of which showed that Fischer's method had been employed and also the so-called Safety Disc Needle, a thin steel needle, which should never be used for mandibular injections. The remarkable thing is that while the safety disc is supposed to remain with the distal part of the needle, it has in all my cases remained with the central part.[5]

In 1919:

In operating on these cases, one should remember that an incision must be made at a right angle to and at about the middle of the needle; that an infiltration will be necessary besides the mandibular injection to assure a bloodless field; that the operator is not in a position to boast beforehand just how long it will take him to remove the foreign body; that one must have patience and a good knowledge of the anatomy surrounding the foreign body. A great many cases can be sutured. No one should attempt to remove a needle unless he is perfectly familiar not only with the parts to be operated upon, but also with the surgical technique.[6]

In 1921:

The operation for their removal should not be undertaken unless the operator feels reasonably sure of success and is prepared in every respect to perform the same.[7]

Again in 1921:

There are altogether forty-four cases which are directly or indirectly the result of some dental or surgical operation or treatment. Of these there are thirty-two hypodermic needle cases. . . .[8]

In 1924:

. . . the present compilation seems to be justified, in view of the fact that in the last two years even a larger number (thirty-three) than in all previous years combined were encountered.

A study of the accidents permits the con-

Fig. 1.—Direct lateral roentgenogram of left mandible taken with mouth wide open, revealing anterior end of needle over inferior dental canal near foramen on line with occlusal plane of mandibular teeth.

Fig. 2.—Direct lateral roentgenogram of left mandible (mouth closed) revealing needle 1 cm. posterior to posterior border of ascending ramus.

5. Blum, Theodor: Notes on Conductive Anesthesia, J. N. D. A., 4:1097-1103 (Oct.) 1917.

6. Blum, Theodor: Failures and Accidents with Mandibular Injections, D. Cosmos, 61:275-302 (April) 1919.

7. Blum, Theodor: Oral Surgery for General Practitioner, D. Outlook, 8:93-100 (April) 1921.

8. Blum, Theodor: Foreign Bodies in and About Jaws, D. Cosmos, 63:1227-1251 (Dec.) 1921.

clusion that the following are the important causes appearing in their order of sequence: 1. Faulty technique. 2. Faulty instruments. 3. Neglect to keep the needle and syringe in one straight line. 4. Interference of patient.

The author in testifying for practitioners, has been accused in court of making statements on the witness stand which do not coincide with the views expressed in his papers. This, of course, is not true. The author advocates the modification of Seidel's method of mandibular injection. He insists on the use of a heavy steel needle and considers it of the utmost importance to keep the needle and syringe in one straight line. However, there are many others teaching the subject of conduction anesthesia and there are as many different views regarding technique and instrumentation. Every one of

Fig. 3.—Roentgenogram of ascending ramus.

Fig. 4.—Roentgenogram of ascending ramus.

these teachers naturally believes that his own teachings are not only correct, but the best. No one, therefore, can be accused of negligence if he employs one of the methods recognized by a large number of members of the profession. Furthermore, the law requires the general practitioner to practice with average skill and care. Although this law protects the general practitioner, he must not neglect to improve his skill and to take great care to avoid a recurrence of these accidents. In these cases, as well as in other accidents, a fellow practitioner only too often forgets that we are all human and liable to make mistakes. One uncalled for remark in the presence of the patient, the patient's relatives or friends, is often the first stimulus toward the beginning of a law suit. Be charitable, no one knows in whose office the next accident may occur.[9]

In 1925:

Conduction anesthesia has furnished a considerable number of cases of needles broken in the soft tissues. If the operation for the removal of a foreign body does not endanger the life of the patient, the writer believes such an operation should be attempted. The exact location of the needle is established first by either stereoscopic examination or by two roentgenograms taken at right angles to each other. With this information and a thorough knowledge of the anatomy of the region and a great amount of perseverance, the average foreign body may be found and removed. Magnets, spirals and other ingenious devices are superfluous. A right angle incision over the approximate position of the needle and careful dissection of the deeper structures are most essential.[10]

In 1928:

The accident having occurred, no one should attempt the removal of the needle without being fully qualified in every respect to do so. Additional breaking of the needle and displacement of the same to positions difficult or impossible to reach, infection,

9. Blum, Theodor: Further Observations with Hypodermic Needles Broken During the Administration of Oral Local Anesthesia, D. Cosmos, 66:322-328 (March) 1924.

10. Blum, Theodor: Modern Conception of the Treatment of Various Surgical Oral Lesions, D. Cosmos, 67:276-280 (March) 1925.

scar-tissue formation, injury to the lingual nerve particularly, increased nervousness of the patient, etc., all add to the difficulty of the operation. Failures are mainly due to faulty x-ray examination, previous attempts (scar-tissue), patient's conduct and the operator's inability.[11]

In 1931:

A very important matter to discuss now is the question of the breaking of needles. Before going any further I wish to say that when one considers the thousands of injections which are given daily, the actual number of these accidents is extremely small. . . . A word of warning and advice in regard to broken needles seems necessary. Do not attempt the removal of a broken needle in your first moment of excitement. Do not permit anyone else to operate unless you know that he is familiar with this field and this operation. The operation for the removal of a broken needle is difficult enough without increasing it by disturbing the tissues and exciting and alarming the patient.[12]

Fig. 5.—Lateral view taken before second operation.

Fig. 6.—Postero-anterior view taken before second operation.

REPORT OF CASE

S. W., a man, aged 63, a Russian, appeared for examination, April 22, 1931.

History.—April 17, the patient's dentist had given him a left mandibular injection for removal of a molar. The needle broke as the patient moved his head. April 18, he was referred to another dentist, who attempted to remove the needle under local anesthesia, but did not meet with success. The mouth was extremely sore when the patient came in.

Examination.—The external examination was negative with the exception of some slight swelling on the left side of the face in the region of the ascending ramus. The opening between the incisal edges was about 2 cm. There was a marked odor from the mouth, and there was evidence of a recent operation in the region of the left retromolar triangle. Swelling of the tissues caused them to be drawn in between the occlusal surface of the upper and lower teeth. A direct lateral roentgenogram (Fig. 1) of the left mandible taken with the mouth wide open reveals the anterior end of the needle over the inferior dental canal near the foramen on a line with the occlusal plane of the mandibular teeth. The needle (approximately 2 cm. in. length) is pointing downward, forming an angle of about 135 degrees with the occlusal plane and extending nearly half its length beyond the posterior border of the ascending ramus.

Treatment.—On removal of the two sutures and an iodoform gauze drain, a deep wound was disclosed about 1.5 cm. in length from above downward and 0.5 cm. in width, but the exact depth was not ascertained. The patient was seen every other day, at which

11. Blum, Theodor: Report of One Hundred Cases of Hypodermic Needles Broken During the Administration of Oral Local Anesthesia, D. Cosmos, 70:865-874 (Sept.) 1928.

12. Blum, Theodor: Two Decades of Local Anesthesia for Dental and Oral Surgical Operations (1910-1930), Oral Health, 21:491 (Sept.) 1931.

time the wound was swabbed with 25 per cent argyrol and an iodoform gauze drain inserted. April 29, the use of the gauze was discontinued.

May 1, stereoscopic roentgenograms were taken. Dr. Fineman reported that the films showed a foreign body, resembling a steel needle, located on the inner surface of the ascending ramus and that the anterior end of the needle lay directly over and very close to the mandibular foramen. The same day, a blood count and urinalysis revealed nothing unusual.

First Operation.—May 4, an operation for the removal of the needle was performed. A local circumscribed injection of 3 c.c. of a 2 per cent procain solution was given in the region of the left retromolar triangle. A vertical incision was made including the

Fig. 7.—Intra-oral film placed against soft tissues of ascending ramus during operation.

opening of the present wound, through the mucous and submucous tissues, and then the deeper dissection was made bluntly, exposing the whole anterior part of the ascending ramus in this region up to the foramen without revealing the needle. The wound was therefore closed with two sutures and an iodoform gauze drain inserted between the sutures after the entire area had been swabbed with 25 per cent argyrol.

Subsequent Treatment.—On the second day following the operation (May 6), the sutures were removed and the dressing was changed. Two days later, at the suggestion of my associate, H. L. Reiss, an attempt was made to remove the needle with a powerful electromagnet, but without success. A direct lateral roentgenogram (Fig. 2) of the left mandible (mouth closed) revealed the needle 1 cm. posterior to the posterior border of the ascending ramus, about 0.5 cm. below and nearly parallel with the occlusal surfaces of the lower molars. May 11, other roentgenograms were taken of the ascending ramus (Figs. 3-4). The patient was seen every other day, when the wound was swabbed with 25 per cent argyrol and an iodoform gauze dressing was inserted. May 20, the gauze was left out, as a marked improvement of the tissues was observed.

Second Operation.—June 4, a new series of stereoscopic roentgenograms were taken at Dr. Fineman's office, of which one each of the lateral and postero-anterior views are shown in Figures 5 and 6. During the fluoroscopic examination, the position of the needle was marked on the skin, namely, just below and posterior to the lobe of the left ear. On that day, the patient was operated on at the hospital. Morphin and hyoscin was used in premedication. The skin line was scratched with the scalpel and the markings were again washed off. An incision was then made through the skin and subcutaneous tissues approximately 3 cm. in length and at right angles to about the middle of the marking. At a depth of approximately 1.5 cm., the needle was encountered, and was removed. It was a thin steel needle. The deeper tissues were brought together with one catgut suture, a continuous silk skin suture was inserted and a dressing and bandage were applied to the outside.

Subsequent Treatment.—On the following day, June 5, the patient left the hospital and was seen at the office. June 8, the outer dressing was removed and argyrol applied to the sutured parts. June 11, the sutures were removed. The patient was seen every other day. June 15, he complained of a slight numbness on the face on that side, which steadily diminished, until July 10, when he was last seen, the numbness had markedly decreased.

COMMENT

In studying the first roentgenogram (Fig. 1), one might at first glance expect difficulties. The anterior point is posterior to the lingula, where the inner aspect of the ascending ramus usually turns outward, this making it impossible

to see through the only possible approach of an intra-oral incision. In order to overlook nothing that might aid the operator, stereoscopic pictures were also taken.

In regard to the first operation, the surgeon might be said to have pushed the needle backward. This could not have taken place because the distance was always measured to determine the anterior point of the broken needle (the distance between this and the posterior surface of the last molar in the roentgenogram and in the mouth). Swabbing and drying of the wound were done with extreme care.

Although I never believed in the use of the electromagnet, it was employed at the suggestion of my associate. In spite of the fact that this attempt was not successful, I cannot believe the use of this instrument responsible for the later position of the needle fragment. I believe that through the loosening of the tissues in this region during the operation, the needle, being in the loose areolar meshwork of the pterygomandibular space, was forced backward by the ordinary motion of the mandible and the muscles, etc., during the act of mastication. Of course, it is rather unfortunate that no roentgenogram was taken immediately after the first operation.

Because the previous papers on this subject may not be available to everybody, a tabulation of the needle cases which have so far come under my observation is given herewith.

The study of the tabulated data gives us the important information that by far the largest number of needles are broken during mandibular injections, unquestionably owing to the employment of the thin steel and iridioplatinum needles for this purpose.

In exactly 50 per cent of all cases, one or more attempts at removal had been made; which shows conclusively the wisdom of selecting an experienced operator.

The distribution of cases according to years is difficult to interpret. The decrease in the number of accidents during the last few years may be due to im-

DATA ON ONE HUNDRED TWENTY CASES OBSERVED

Youngest patient	6½	years
Oldest patient	69	years
Male	65	cases
Female	55	cases
Mandibular—Right	51	
Mandibular—Left	48	
Mental—Right	1	
Tuberosity—Right	2	
Tuberosity—Left	4	
Infra-orbital—Right	2	
Infra-orbital—Left	1	
Infiltration—Right	5	
Infiltration—Left	4	
Anterior palatine (left)	2	
Thin steel	111	
Heavy steel	3	
Iridioplatinum	6	
Attempts at removal		
None	60	
One	48	
Two	8	
More than two	4	
Operated on under local anesthesia	118	
Operated on under general anesthesia (Cases 37 and 61)	2	

In cases 37 and 119, the needles were removed externally.

The longest interval before final operation was 4 years (Case 77).

Failures:

Case 19 (iridioplatinum needle broken into two parts).

Case 74 (thin steel needle broken into three parts, of which only one was removed).

DISTRIBUTION OF CASES ACCORDING TO YEARS

1914..... 1	1920.....10	1926.....10
1915..... 0	1921..... 9	1927..... 7
1916..... 1	1922.....12	1928..... 6
1917..... 2	1923.....18	1929..... 7
1918..... 4	1924..... 9	1930..... 3
1919..... 8	1925..... 8	1931..... 5 (to Oct. 1)

proved methods or to an increase in the number of successful operators.

In an attempt to solve the problem of broken needles, the following three points may be helpful:

1. Proper study of the subject and employment of correct instruments for injection.
2. In case of accident, notification of the company in which insurance is carried.
3. The selection of an experienced operator.

The dentist to whom the case is referred will investigate the case in order to avoid future accidents. He will therefore ask the referring dentist for a complete description of the technic and instruments used and how the accident occurred. He will then study the right angle roentgenograms to determine the position of the needle. These films will practically always be found faulty.

The operation is preceded by the usual general examination including one of the blood and the urine, and by means of the roentgen-rays. A postero-anterior and a direct lateral plate, in other words two exposures at right angles to each other, are essential. In doubtful cases, a stereoscopic study will be necessary, but only rarely must the fluoroscope be employed. During the operation, an intra-oral film placed against the soft tissues of the ascending ramus has been found very useful and informative (Case 116, Fig. 7). Local anesthesia is my choice.

The operation is as a rule difficult. It has been described previously. A good knowledge of the anatomy of this region, good assistance, good light and patience in the true sense of the word are essential. The after-treatment does not differ from that in other surgical cases. Trismus must be cared for early.

Although this accident is as a rule not actually the dentist's fault, it is, I believe, a good policy for him to assume the financial responsibility. The insurance company will unquestionably pay any reasonable amount. The operator will naturally not charge the dental practitioner whom he knows, but there is no reason that a dentist who has no professional relation with the operator and whom he does not know should not remunerate the operator for services rendered to his patient, the fee to be in accordance with the practitioner's means. No fee should be charged to young practitioners or anyone who cannot afford to pay anything. I do not believe in the old custom of a physician or dentist giving his services free to his colleagues and their families. I personally pay for services rendered to me or members of my family except to those whom I know very intimately, and every medical and dental practitioner should do so in accordance with his means.

A friendly and sympathetic attitude toward the patient will always be the best policy and will bring these unfortunate accidents to a happy ending. The question of right and wrong is not always justly decided in court.

101 East Seventy-ninth Street.

DISCUSSION

E. C. Hume, Louisville, Ky.: Doctor Blum has continued to warn the members of our profession of the dangers connected with the broken needle problem since the beginning of conductive anesthesia by our profession. He started early to warn us of the dangers in local anesthesia and has given us, in language understandable to all, a procedure which will both minimize the number of accidents and secure the best end-results in the removal of these foreign bodies. Too many of us feel that once we have seen an injection made or an operation performed, we ourselves can repeat the procedure. Such is not the case. One must have a fundamental knowledge of anatomy and surgical procedure

in order to assure the best results. I agree that the needle should pass through the tissue in a straight line and I see no reason that this technic should be varied, and if this technic is carried out, with proper consideration given to the type of needle used, such accidents will be greatly minimized. While I have removed a considerable number of broken needles and other foreign bodies, my experience has not been so wide as that of Dr. Blum. I agree with him that these needles should be removed and that the best method of removing them is the surgical procedure which he outlined in his paper. I have never been able to use the electromagnet with success. I agree that when a needle is broken, the case should be immediately referred to one familiar with the procedures necessary for its removal. This warning has been sounded many times by Dr. Blum and others, yet I have only had one broken needle case referred to me without an attempt having been made to remove it by the operator or some of his professional friends. Carefully made roentgen-ray pictures, lateral and posterior-anterior, are essential, and if it is possible for the patient to open the mouth, these pictures should always be made with the mouth open to the extent desired for the operative procedure in removing the needle. This is obvious when we consider the changed position of the needle, in some cases, when the mouth is opened or closed. Stereoscopic films are oftentimes advantageous. Fluoroscopic examination with the patient opening and closing the mouth will prove that a needle changes position considerably, and, in some instances, after incision has been made, the foreign body can be picked up by the use of the fluoroscope when it otherwise might not have been located. Since a certain number of these needle cases will continue to find their way into the courts, it is of the utmost importance that proper consideration be shown the patients and that they be placed in competent hands before they have time to talk to their families or their neighbors and receive the suggestion of a legal procedure against the person who is unfortunate enough to have the accident. Dr. Blum states that he "believes the dentist should assume the financial responsibility, although most cases are not actually the dentist's fault." I do not believe that the dentist should assume the financial responsibility for the removal of a broken needle since this would be considered by the courts as admittance of his guilt as to the responsibility for the accident. If such cases are promptly reported to the insurance company and placed in competent hands, but few of these cases will result in legal procedures, and the operator who has the accident can feel sure that the best possible service was rendered his patient.

Sterling V. Mead, Washington, D. C.: Most of us do not learn the great advantage of the carefully kept record system, which allows Dr. Blum to give us the result of his experiences in this problem. I have the highest appreciation of the labor involved in a study of this nature. In a subject of this nature, the paraphernalia should be given very careful consideration. I believe that the old method of keeping syringes in alcohol or chemical sterilizing agents is not a good one. There are certain loopholes for errors in sterilization and there is also danger of the syringe or needle's retaining the alcohol or other irritating chemical, and the latter's being injected into the tissues. I advocate either boiling or autoclaving the syringe and needle after each case. When this is done, I find it is best to have a regular routine. I prefer a 1⅝ inch 23-gage steel needle, as it is easier to keep sharp and thereby the pain of the injection is reduced. I advocate having a regular time for changing needles. We change our needles every Monday morning, even if a new needle was put in Saturday. If a needle becomes dull or damaged during the week, it is replaced, but it is again changed on Monday. In this way, there is no danger of a needle's remaining in use until it becomes rusted inside and liable to break owing to this damage. This plan may not suit all cases, as some operators may make only occasional use of the syringe and prefer an iridioplatinum needle. In any plan, the needle should be watched carefully and when it becomes weakened for any reason, it should be replaced. I believe in a plan of direct approach in making the injection, and, above all, in using a technic in which the needle is not bent or under stress in the tissues. Not all of the needle should be inserted into the tissues. I have read a number of articles and books in which the authors make the statement that there is no excuse for breaking needles. I feel statements of this kind are always an incentive for lawsuits. Like Dr. Blum, I have never broken a needle, but I do not believe the breaking of a needle is necessarily the fault of the

operator and denoting an improper technic or lack of care. It is always possible for the patient to move or jump or throw up an arm at the wrong time and thus be responsible for the accident. I feel, therefore, that writers should be very careful in their denunciation of an operator for this accident. In the removal of broken needles, the needle should be very carefully localized by lateral and postero-anterior films, and, in some positions in the mouth, by occlusal views. In the mandibular region, it was formerly my practice to make an incision at right angles to the center of the needle and retract the tissues in two directions. I now favor a flap operation. In removing a needle broken during a mandibular block anesthesia, I make an incision from the distal gingival margin of the second molar over the crest of the ridge running back and up over the anterior surface of the ramus as high as is necessary, and particularly high when the needle is in the mandibular notch region. The flap is brought forward on the buccal side of the second molar. When this flap is retracted and pulled both lingually and labially, free access is had to the deeper structures. A small light lancet is then placed above the needle and brought downward at right angles over the center of it until the needle is felt. The overlying tissue is then separated and the needle removed with a pair of pliers with serrated broad beaks. In some cases, I have found the modified eye magnet to be of great service. The magnet is used for only steel needles or instruments. It is necessary to uncover the underlying foreign body, or at least free the object. The magnet will not pull a needle out if it is held beneath fascia or muscle. In most cases, the use of the magnet is not necessary and it is of no real advantage, but there are occasional cases, when the operator is having great trouble in locating the needle, in which the magnet will bring into view needles that might otherwise not be found.

ACID BURN: REPORT OF CASE

By T. E. BRALY, D.D.S., Chattanooga, Tenn.

THE patient presented a very deep acid burn on the inner side of the lower lip. The burned area was about the size of a man's middle finger nail and extended over the labial border, the wound being thus exposed to the saliva and air. The suffering was intense.

In the absence of any previous experience with a lesion of this kind, it was decided to dry the injured area gently with warm air and apply compound tincture of benzoin. Relief was almost immediate. Treatment was repeated once or twice daily for about a week. Very little scar tissue remains.

Volunteer Bldg.

THE FUTURE PRACTICE OF OPERATIVE DENTISTRY*

By ARTHUR D. BLACK, A.M., M.D., D.D.S., Sc.D., Chicago, Ill.

BEFORE looking into the future of the practice of operative dentistry, it might be well to review the trend of service in this field. In the early days, clinical teaching and professional practice were divided into two divisions, mechanical and operative dentistry. At the time the St. Louis Dental Society was organized, the practice of dentistry consisted, in the main, of the extraction of teeth and making of full or partial dentures of gold and later of vulcanite. Operative dentistry was of rather minor importance. Fillings were, for the most part, limited to the bicuspids and molars. When the front teeth were much decayed, they were oftentimes extracted and a "horseshoe" partial denture was made. The periodical literature of that time records numerous cases in which patients swallowed these small dentures supplying the upper incisors. As recently as fifty years ago, a majority of dentists were pleased if their monthly income from operative work was sufficient to pay the office rent and a few incidental expenses; their "real income" being almost entirely from plate work.

I knew one dentist, a very old man who passed to his reward some years ago, who practiced in Southern Illinois and claimed to be the champion extractor in his section of the state. He confined his practice to extractions and plates. For some peculiar reason, he had saved all the teeth that he had extracted, and at the time that I knew him, he had between 25,000 and 35,000 teeth in a number of boxes.

During this period, there were a number of practitioners who were very expert in the manipulation of gold foil, and it was largely through their efforts that operative procedures attracted an ever-increasing number of dentists. There was no finer example of this group than H. J. McKellops, of St. Louis. Gold foil held the center of the stage as a filling material until about 1910. Since that time, the gold inlay has, to a very large extent, superseded foil, particularly in the bicuspid and molar teeth. Gradually, the so-called operative field became more important. Interest in it was probably given its greatest impetus after the organization, in 1888, of the "Institute of Dental Technics," consisting of the teachers of operative dentistry in the colleges. This resulted in the establishment of laboratory courses for the study of both the anatomic forms and the internal structure of the teeth, also the technic of cavity preparation, filling operations, pulp treatments, etc. For the first time, the teaching and practice of operative dentistry was placed on a scientific basis. Standard forms of instruments were designed with a definite nomenclature and formulas which were invaluable in teaching. Previously, it had been impossible for a teacher to mention an instrument in such a way that a correct idea was conveyed.

*Read before the Seventy-Fifth Anniversary Meeting of the St. Louis Dental Society, Dec. 7, 1931.

The treatment of the dental pulp and the alveolar abscess was entirely on a basis of maintaining the usefulness of the tooth in mastication, with little or no regard for possible systemic infection. Dead pulps were removed and medicaments were placed at several sittings without being sealed in. When, after the removal of the medicament, a hot root-canal plugger could be placed in the canal without the "sizzling" which indicated the presence of fluid in the canal, it was considered ready for the root filling. A chronic abscess with a sinus was treated by forcing some caustic, such as phenol, through the root canal and sinus tract, followed by the filling of the canal. It took a great many years for the profession to realize that the pulp and the apical tissues were in intimate connection with the rest of the body through the circulation.

Disease conditions of the supporting tissues of the teeth were treated on an entirely empiric basis. The fact that pockets contained pus gave no especial concern for the health, although it was conceded that the pockets were getting deeper and the teeth were loosened. All treatment was designed to secure the reattachment of the pocket tissue to the root. We have been unable to find in the literature a record of the microscopic examination of diseased peridental membrane previous to 1911, when I made a "surgical extraction" to secure tissue for that purpose. These studies, and similar studies by many others, have served to convince most dentists that reattachment of pocket tissue to the cementum is no more possible than the complete healing by reattachment about the apex of the root in cases of chronic alveolar abscess. This has changed entirely the attitude of the more thoughtful men of the profession.

We might refer to the period previous to 1885 as one in which the extraction of teeth and the making of artificial dentures occupied most of the dentist's time.

From 1885 until about 1912, as much more attention was paid to operative procedures and to the use of crowns and bridgework, there were fewer extractions. The slogan during this period was to retain every tooth that could possibly be kept of service for mastication. It was the rule to devitalize all teeth that were to be crowned, and there was much laxity in asepsis in pulp treatment and in the technic of root filling. Chronic abscesses and pyorrhea pockets gave no particular concern, as long as the teeth could be used without too much discomfort.

With the coming of knowledge of focal infection and the roentgen rays, radical changes occurred. Millions of teeth were extracted in the effort to prevent or cure systemic disease. Probably, the majority were extracted without sufficient evidence to justify their removal. Extraction called for replacements, and a "boom" was on for the extractor and the prosthetist. So much attention has been centered on bridgework and dentures that operative dentistry has made the front page much less often; in fact, it has been crowded from the center of the stage.

During this period, the average operative service has declined in its effectiveness as a result of the too extensive use of silicious cement. The excellent initial appearance of this material stampeded the profession, notwithstanding the overwhelming clinical evidence that it is lacking in all of the desirable qualities of a permanent filling material.

WHAT OF THE FUTURE?

We might refer to the period previous to 1912 as one during which the dental

profession promoted bad health by saving teeth. During the past twenty years, we have extracted teeth to promote good health. Possibly the time has arrived when we should save teeth to promote good health.

Certainly, the dental profession cannot maintain its standing in the eyes of the medical profession or the laity unless ways and means are found to reduce materially the number of teeth that are condemned to extraction. An interesting sidelight on the recent program of extraction and replacement is afforded by the fact that the average adult who has his natural teeth may exert a force of about 170 pounds in mastication, while the average for persons wearing full upper and lower dentures is probably not over 20 pounds, the range being from 5 to 40 pounds. Most people with artificial dentures cannot force the bicuspids and molars through a piece of beef.

It is fundamental to the accomplishment of the new program that we think of patients in terms of their full period of life. There can be no argument regarding the statement that the dentist can be more successful in conserving the teeth of those who first come to him as young children. The ideal program of practice management is one that begins with a child at the earliest time at which it may need dental attention—at about the age of 3. This program should be the one most likely to prevent the occurrence of infections which may be a menace to health and at the same time assure a reasonable number of teeth for the later years.

It is not the intention to discuss technical methods of practice, but rather to call attention to certain rules of practice management which will undoubtedly conserve the teeth much more effectively than is generally done today.

Much has been said and written in recent years on the economic side of dental practice, and while it has been the rule for even the most enthusiastic of the economists to announce in their perorations that good service should always have first consideration, the fact remains that too many dentists have accepted a commercial program, designed to increase their incomes, without developing a corresponding interest in improved service.

It is quite as important to have good service records as exact financial data. The service record should show as definitely the quality of service as the financial record does the relation of income, expenses, savings, etc. It is not sufficient that a dentist keep a record of fillings and other operations performed. He must record conditions and the after-effects of operations. He should be able to check back over a given period and learn to what extent his operations have been successful, and when and why they have failed.

Much progress in medical practice has resulted from the keeping of accurate case histories and their subsequent study. The accumulation of tabulations of the conditions and treatment of a given disease by a considerable number of physicians has generally resulted in the adoption of the best available methods by the majority. Such studies have progressed to the point where many diseases have been brought under control.

A system of practical case histories should be in use by the dental profession. These should lead to the development of knowledge of the value of each service in conserving the teeth, with an analysis of the failures. These records should enable the individual dentist to determine his own measure of success in relation to others. It should also be possible for him to visualize his accomplishment for each

person who has been under his care over a period of years.

As a single example of the value of keeping accurate records, I have taken from my own case histories of pulp treatments, which have been kept with great care over a period of thirty years, the total number of pulps removed during each five-year period. Beginning with the five years, 1901-1905, the figures for the six five-year periods are: 408, 352, 355, 262, 155 and 103. For the fifteen years 1901-1915, the total was 1,115; for the last fifteen years, 520. For the last five years, the numbers were: 1926, 27; 1927, 17; 1928, 21; 1929, 25; 1930, 13; an average of 20.6 a year. These figures for the past fifteen years show the effectiveness of the program of practice management which is herewith presented. There has been no change in my attitude on pulp treatments during the past fifteen years, yet the number removed has been reduced by more than 60 per cent.

An office routine of patient management will be suggested. This routine should be applied to both adults and children, but is likely to be especially effective when it is established and carried out from a beginning in early childhood.

The first essential in successful service is an appreciation by the dentist himself of the importance of proper care of the deciduous teeth, followed by the education of parents and others to the necessity of bringing children to the dentist when they are 3 years of age. The second essential is that every patient, child or adult, shall come in for examination as frequently as may seem desirable for the best care of his mouth. "Early and sufficiently often" should be the slogan.

The dentist should offer to assume responsibility for sending notices or appointments for reexamination.

It will not do to say to a patient, "Come in again in six months." Anyone who keeps a record of such a plan will find that the average patient does not come back in a year and a half. They do not come back, as a rule, until they have a little pain somewhere, which means a pulp is involved. The conservation of the pulp is based on a well-carried-out plan of periodic examination.

A simple plan has been followed in my office for many years. When we are through with a series of operations for a new patient, I say to him, "Your mouth ought to be examined again in four months" (or six months—whenever I think it should be examined). My assistant then adds, "If you wish me to, I will make a memorandum to send for you in six months, because you are likely to forget it." The majority say, "I will be glad to have you do so." Some do not. Sometimes, we argue a little with them, but never press it, because we do not wish to give the impression that we are trying to tie a string to them. That is the reason my assistant says, "If you wish me to do so." We make the patient ask us to do so, as a matter of service to him.

At the end of whatever period is designated, we send a little note in which we say something like this: "Six months having elapsed, in accordance with your request we are enclosing an appointment for an examination." We again insist on emphasizing the fact that we are doing so to accommodate him. Then we add, "If for any reason it is not convenient to keep this appointment, please telephone and cancel it." We give the patient full freedom to cancel the appointment if he so desires.

If the patient returns for the second series of appointments, when they are completed my assistant says, "We will send for you again in six months." The patient generally replies, "I will be

obliged if you will do so," and goes his way. The relationship is considered established, and at the end of the next period, we call by 'phone to give him the appointment. That is a simple program which a good many dentists have not bothered to establish. When a patient is placed on that basis, particularly a young patient, the opportunity is afforded to examine the mouth often enough to discover most cavities before the pulps are involved, and should enable one to practice very conservative dentistry. Incidentally, if the pulps are not involved, it costs the patient less money. It means that we can take care of more patients, and that we will be relieved of the more unpleasant things in service. Dental practice becomes less unpleasant for the patient and less irksome for the dentist.

The office routine of patient management may be centered in a single card, which we will call the practice management cycle card, because it is the guide for our management of each case through a never-ending series of cycles, as long as the individual continues as our patient. It is, in reality, the examination card. Almost any examination form will answer the same purpose.

We make a record of our examination on this card. The next important thing in the management of our practice is to have a financial understanding with the patient. It will be stated here only that the financial arrangement or understanding is noted on the reverse side of the examination card.

As the work progresses, we check off on the examination card each item as it has been accomplished. Then, as the patient returns each time, I glance over the examination card before the patient comes into the operating room and note the operations which have not been checked off as finished and generally decide what I will do at that sitting before I see the patient. No time is lost in a partial reexamination after the patient is in the chair.

I also glance over the patient's permanent record card before he enters the operating room to note what was done for him at the preceding visit. This is considered important in the management of patients. Suppose we had removed a pulp. When the patient returns, it is a very nice expression of interest to ask whether the tooth has been comfortable.

I might cite a case in which a patient from out of the city came to me, a woman for whom I had removed an impacted lower third molar; not a serious impaction. The tissues were so little damaged that she returned to her home the same night. About twelve years afterward, this woman returned, and, in glancing at her record card before she came into the operating room, I noted the molar extraction. I had entirely forgotten her. It was the only thing I had done for her. When she came in, I asked her whether she had had any serious trouble where we took out that tooth on the lower right side. The expression on that woman's face indicated her thought that I had been concerned about her during the twelve years. Interest in our patients may be expressed by any little inquiry as to their comfort during the period since they were in last. For yourself, incidentally, it connects the previous service with that of today. You pick it up where you left off.

The series of operations having been finished, and the understanding reached that we are to send an appointment notice for reexamination at a certain time, this same examination card is used as a reminder, being placed in the proper place in a monthly file for the purpose. We must have a plan by which there will be

no failure in our promise to send the appointment.

We also use this card to carry over to the next examination any item that may be of importance. In the examination of a mouth, it oftentimes happens that something is found or is discussed that is not to be taken care of during the particular series of appointments. Take, for instance, a case in which there is a lower first molar missing and there is a question of replacing that tooth. There is some discussion as to whether it should be done. We may tell the patient what it would cost. The patient decides not to have it done then. We have those data on the back of the examination card, and when the patient comes in for another examination, we are reminded by the notation on the card and we may raise the question of replacing the first molar. We pick up the case where we left off.

It is also important to note instructions to the patient in matters of oral hygiene. We may find an area where decay has barely started; a white gingival third area, but no cavity as yet. We caution the patient to brush that area properly so that it may not require filling. We make a notation on the card, and six months later, when that patient returns, we are reminded to examine the spot to learn whether he has been successful in preventing a cavity. Suggestions regarding diet and other matters may be similarly recorded and carried forward to the time of the next examination. You will appreciate that it is worth while to have such a continuity of service and thought in relation to each patient.

Finally, when the patient returns for the next examination, we use this card as a check-up on what was done at the last series of appointments, and I usually tell the patient that I am doing so. This is another expression of interest in the patient and in the service that I am giving him. I have this examination card in my hand and say, "The first thing I want to do is to check over what we did for you the last time you were in." It is worthwhile to check upon ourselves to learn whether our service is as good as we think it is, and if we find something that is wrong, it spurs us on to attempt to do better.

I have found this of special importance in the case of inflammation of the gingivae and peridental membranes. For example, if I have done something intended to cure an area of gingivitis, such as the replacement of a filling to restore a proximal contact, I wish to check up on that, and on every similar operation, to keep myself constantly informed as to the real value of this service in the prevention of pyorrhea.

We have, then, used the examination card for the following: (1) to make a record of the examination; (2) to record the financial arrangement; (3) to check each operation as it is performed and note operations yet to be carried out just before the patient reenters the operating room at the next appointment; (4) to note any matters to be carried over to the next examination, a few months later; (5) to remind us to make a reexamination appointment; (6) when the patient returns, to check up on operations previously performed.

This card has thus served through a complete cycle from one examination to the next. A new examination card is then made out and the cycle is repeated.

If the service objective is the conservation of the teeth, why not have a record which will show the progress of this effort? This may be done in a very simple way. If a series of diagnostic charts are used, one for each year, and a record of the services rendered for an individual

patient each year is transferred to one of the charts, there will be developed, without much effort, a year-by-year record. All of the operations on each tooth will be shown in sequence. Pulp deaths and pyorrhea pockets will appear in relation to other operations. The loss of each tooth should be explainable with such a record. Finally, it will tell, in a graphic way, the dentist's success or failure in his management and care of each patient. If, after twenty-five years, the record of a patient who came in as a child shows a full complement of teeth, all with vital pulps and with the investing tissues in good condition, the case has been well cared for and is a credit to the dentist. Cases in which teeth have been lost and chronic infections have occurred will be a reflection on the dentist's care.

DIET STUDIES IN RELATION TO DENTAL CARIES

One cannot discuss the future of operative dentistry without giving special consideration to dental caries and the researches related thereto.

The fact that many primitive races were, and several still are, immune to dental caries has established the belief that diet is one of the primary factors in decay of the teeth. It seems likely that the changes in dietaries or in the treatment of foods by cooking and otherwise that have occurred coincidentally with the development of higher civilization are in large measure responsible for the extreme susceptibility of all civilized races to dental caries. During recent years, many valuable diet studies have been made, but it is very unfortunate that practically every investigator has entirely ignored the facts quite definitely established by the research workers who preceded them and have reopened a long and hard fought controversy which was presumably settled nearly forty years ago; i. e., the question as to whether dental caries is primarily a vital reaction within the tooth tissues, or occurs as the result of the action of acid produced by organisms in the mouth.

It is well known that W. D. Miller, J. Leon Williams and G. V. Black devoted many years to this study. Facts were developed which convinced the profession of thirty or more years ago as to the process of tooth destruction in caries, and no evidence has been presented in recent years to disprove their findings. They followed and explained every step of the carious process in its beginnings, gradual involvement and destruction of the tooth structures, leaving apparently but a single factor unsolved. In brief, the facts are: 1. The structure of the tooth, except in gross defects such as pits and fissures, has little or no relation to the occurrence of decay. This statement was supported by careful quantitative analyses of the calcium salts of the dentin, which were found to vary less than 5 per cent in more than 100 teeth, each with a definite history, some from the mouths of persons immune to caries, others extremely susceptible, etc. This statement is further supported by extended clinical observation of teeth with enamel so poorly formed, as in cases of mottled enamel, that there is no cementing substance between the rods and an exploring instrument may be easily passed into the substance of the enamel, yet there is reported less of caries than in mouths with teeth of normal structure. 2. Caries always begins on the surface of the tooth or in a defective pit or fissure in the enamel and gradually progresses inward. 3. Caries practically always begins in certain protected spots and spreads on the surface within definite limits which are exactly definable as the area of liability

for each surface. 4. Caries practically never begins elsewhere on the surface of a tooth, and the dentin is never involved until the enamel has been penetrated. 5. The dissolution of the structure of the tooth is caused by an acid formed by micro-organisms which are protected by a gelatinous plaque in such a way that the acid is confined to the particular spot and not allowed to become dissolved in the saliva. 6. The acidity of the saliva has nothing to do with the occurrence of decay.

As a part of these studies, Miller made cultures of the organisms from the deeper areas of decayed dentin. Cubes of sound dentin, placed in the culture medium in the test tube, showed, in due time, decay that corresponded exactly to decay as it occurred in teeth in the mouth. G. V. Black duplicated this experiment many times. He also placed natural crowns from extracted teeth in the mouths of patients, attached to the roots with posts, and noted the occurrence of decay of these teeth, in the same locations where decay regularly begins, notwithstanding the fact that the persons from whose mouths the teeth were extracted had enjoyed a high degree of immunity.

The one unsolved factor was the condition of the saliva which made possible or was conducive to the formation of the gelatinous plaque, or protective covering for the colony of micro-organisms.

In the diet studies of recent years, there has been much confusion between the period of the calcification of the enamel and the period after the teeth are fully formed. There can be no question that, during the years of tooth calcification, a proper diet may be reflected in the structure of the teeth, because vital forces are busy with tooth building. On the other hand, after the enamel is once formed and the cells which form it have disappeared, there appears to be no way in which vital changes may occur in the enamel, and no investigator has presented evidence that there is metabolic change in enamel structure.

The following quotations are taken from a paper read recently by Frederick B. Noyes before the Greater New York December meeting:

There are three types of publication which have occupied many pages in the literature in recent years and which tend to produce misconceptions in the mind of the general profession. First, a statement of personal opinion without any evidence whatever; second, the expression of hypotheses without adequate factual support; and, third, the report of carefully conducted experimental research and the development of valuable facts, from which incorrect inferences and deductions are drawn.

In the October issue of the *American Magazine* for 1930 there appeared an article in which Percy Howe, one of the most prominent dental research workers in America and an ex-President of the American Dental Association, is quoted as saying, "Decay of the teeth is not as many people still believe caused by bacteria. It is a form of bone degeneration resulting from improper food, food lacking in mineral salts and the mysterious vitamin C." It is impossible to understand how any person in possession of the facts, laboriously developed in the last half century, could make such a statement, and the damage that is done by such a supposedly scientific statement in a popular magazine is hard to estimate. I am issuing a challenge for anyone to produce a patient showing the characteristic active attack of caries on the surface of a tooth from which acid forming bacteria cannot be recovered.

In the June number of the *Dental Cosmos* for 1929, page 590, C. F. Boedecker states that "the odontoblasts have been commonly regarded as having solely the function of forming the dentin, but further investigation will *probably* prove their permanent and most important function to be the nutrition of the dentin as well as that of the enamel." No evidence whatever is presented. In the next paragraph, "the odontoblasts may be regarded as cells specialized

to select suitable constituents from the blood plasms for making up the dental lymph." Certainly no such statement should be made without presenting facts which justify it.

In the August number of the *Journal of Dental Research* is an article by E. V. McCollum entitled "Diet and Dental Caries." On page 557, the author says: "There can be no reasonable doubt that there is a close relation between deficiency of vitamin D in the diet and the structure of the teeth. The work of Mrs. Mellanby on puppies has demonstrated clearly that diets of a character which tend to produce rickets tend also to interfere with the proper calcification and enamelling of the teeth." There is evidently here incorrect reasoning. The work of Mrs. Mellanby definitely established the effect of disturbed nutrition on the formation of the dental tissues. It does not, however, establish as a fact the theory that disturbances of nutrition produce degenerations in the portions of the tooth already formed and there is nothing in these facts to prove that the tooth of imperfect structure is the cause of dental caries, nor even that in itself it greatly affects the rate of destruction of teeth by caries.

It may be added that it has been a common error in diet research for investigators to reason by analogy that changes which may be produced in very vascular bone also occur in dentin, and, if in dentin, why not in enamel? Thereafter, they proceed as though something has been proved about enamel, when, as a matter of fact, enamel has not been studied.

I have called attention over and over again to the importance of diet studies in relation to the composition of the saliva. All clinical evidence of changes in susceptibility and immunity to caries, such as increased susceptibility during pregnancy, the sudden changes following fevers, such as typhoid, is explainable on the theory of modifications of the saliva.

In view of the facts laid at our feet by our best research workers of the past, it would seem most logical to study the effect of various vitamins on the saliva, yet no investigator has done so. There is reason to presume that the secret of the formation of the gelatinous plaque may be found. In fact, in any case in which there might occur a complete or partial arrest of caries, apparently as the result of a particular diet, the facts before us would justify the conclusion that the change had become operative through the saliva and not as a result of a modification in the structure of the enamel.

CONCLUSION

May I suggest that the finest ideal of service and the most definite indication of good practice and patient management is to so care for a child who comes to you at 3 years of age that it will have, when adult life has been reached, a full complement of teeth with vital pulps and healthy supporting tissues. Nothing less should be our goal, and in whatever measure we attain this, there will come to us satisfaction in later years for having accomplished something to promote the health of our patients and to assist in the establishment of dental service on the principle of conserving both the teeth and the general health.

MOBILIZATION OF THE ANKYLOSED JAW*

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AN intimate cooperation between the various specialists in dentistry and the surgeon is essential in securing the maximum percentage of satisfactory end-results in the treatment of affections of the jaw. Unfortunately, this fact is too frequently not recognized, much to the detriment of the patient, who must suffer throughout his entire life from complete loss or great impairment of the most important function of mastication.

This lack of cooperation, I must admit, is far more frequent on the part of the surgeon than on that of the dentist. This is often observed after improper treatment of fractures, osteomyelitis and neoplasms of the jaw. If there is the slightest misplacement after a fracture of the mandible, occlusion of the teeth will be impaired for life, with mechanical injury to the teeth and great discomfort. In gross defects, function is more seriously impaired, but also there are seen unsightly distortions of the face. Correction of defects after fractures and other affections often cannot be satisfactorily accomplished after union in malposition or loss in continuity of structure. Therefore, the prime importance of team work throughout between the surgeon and the dentist cannot be too strongly emphasized.

As it is impossible to consider all affections of the jaw in a short space of time, the discussion will be confined to mobilization of the ankylosed jaw. This condition may be due to intra-articular or extra-articular restriction of motion, and, when it is complete, the patient cannot open the mouth, with incident oral sepsis and decay of the teeth. Obviously such teeth are inaccessible and the individual often suffers untold agony without hope of relief. As mastication is lost, there may be associated nutritional disturbance from an improper or imbalanced diet. On this occasion, intra-articular lesions alone are considered.

The treatment of an ankylosed joint, long a difficult problem to the surgeon, has until recent years remained unsolved. The first successful operation for this purpose was performed by J. Rhea Barton, of Philadelphia, in 1816, for ankylosis of the hip. His procedure consisted in inducing a pseudoarthrosis or ununited fracture near the joint, after wide excision of bone. Motion was restored, but the procedure did not restore function, as such a joint will obviously be unstable and will not endure the necessary wear and tear of normal daily use. In France and England, an operation for excision of the elbow has long been commonly employed to restore motion, but such a joint is not stable and is incapable of meeting normal demands.

Various other measures also have been used in an effort to induce motion in the jaw and other joint in which there was fusion of the articular surfaces. These consisted largely in placing foreign ma-

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terial, such as cotton, wood, celluloid, glass and silver plate, between the raw bony surfaces, hoping to prevent subsequent fusion and to restore movement. Such methods were notably unsuccessful since they violated the laws of normal physiology, the foreign material acting as an irritant causing further erosion of bone, infection with final extrusion, recurrent ankylosis and more inflammatory reaction and the development of scar tissue. Brisement force or forcible movements have also been used with the same disastrous results, as fibrous and osseous union are roughly destroyed and even fractures may be induced. Unfortunately, even today surgeons still employ such useless measures in the effort to restore function to a joint. Neither the jaw nor any other joint in which there are extensive organic changes such as occur in complete intra-articular ankylosis should be submitted to such treatment.

The only operation to be considered at the present time for mobilization of an ankylosed joint is "arthroplasty," and due consideration must be given to restoration of a joint that will restore function, but not necessarily anatomic detail. This procedure must take into consideration not only the osseous union but also all of the component parts required in function, such as nerves, muscles and extra-articular structures. Wide excision of bone as above described will restore motion, which is obviously not synonymous with real function.

The first arthroplasty of any joint, performed on the jaw by Verneuil in 1860, was not much different in principle from the present day procedure, which will be later described in detail.

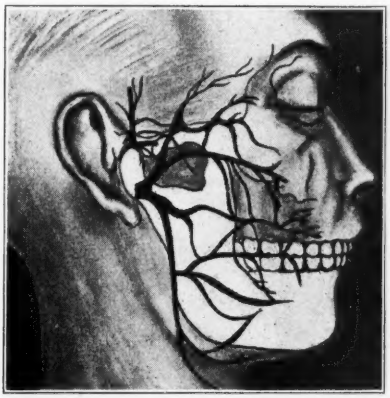

Fig. 1.—Location of skin incision in relation to temporomaxillary joint and branches of the facial nerves.

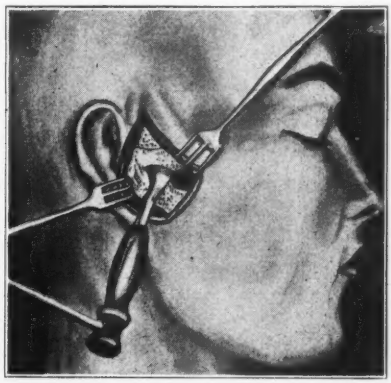

Fig. 2.—Osseous fusion of temporomaxillary joint broken up with a sharp chisel.

There are two types of intra-articular ankylosis, osseous, or bony, and fibrous, but there is no material difference in the management of the case with bony fusion or with dense strong fibrous tissues binding the articular surfaces together.

The most frequent cause of intra-articular ankylosis of the jaw is acute pyogenic infection, though any of the various joint affections which cause ankylosis in other joints may induce a similar reaction in the

temporomandibular joint. Fractures or other traumatic lesions rarely cause ankylosis of the jaw, but may more often induce restricted motion.

Ankylosis of the jaw from pyogenic infections or osteomyelitis of the inferior maxilla is extremely rare in adults. The occurrence is by far more frequent in young children between the ages of 3 and 12 years. Ankylosis of the jaw from chronic progressive polyarticular arthritis is far more common in adults than in children. Pyogenic infections of the jaw, as in other joints, may be confined to the articulation or there may be an extensive

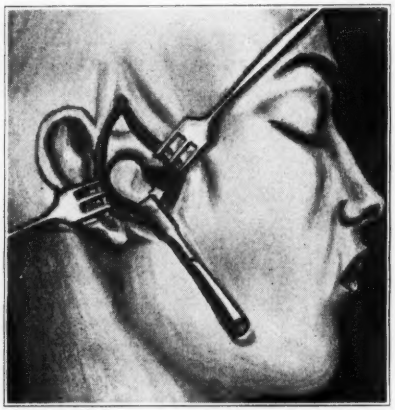

Fig. 3.—Excision of one-half inch of bone from condyle of mandible.

invasion of the adjacent bone by acute osteomyelitis. When this occurs, the condyle of the mandible increases in size until the dimension may be 1 or 2 inches, or about three or four times that of the normal. The bone trabeculae become organized and are continuous with those of the temporal bone, and often no joint line may be visible to the roentgen-rays, the jaw and skull being continuous.

The symptoms and diagnosis of ankylosis of the jaw are so obvious as to require scant description. The process is more frequently unilateral, being rarely bilateral, except in those with progressive infectious polyarthritis or so-called rheumatoid arthritis. When bilateral, there is no motion, but in the more frequent unilateral involvement, on attempted voluntary motion, the mandible will deviate to the opposite side from that of the ankylosed joint. Also, movement can be detected over the unaffected joint on palpation. On inspection, there is more atrophy on the affected side and the characteristic facial asymmetry is present. The roentgenogram is also of value in differentiation. If only the joint proper

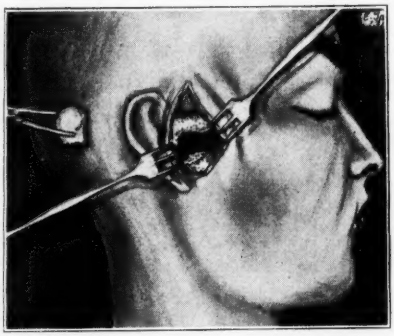

Fig. 4.—Fragment of condyle removed, allowing about one-half inch of space between bone surfaces.

has been involved, as a rule the joint line is usually visible, though much diminished in width, with more or less destructive and proliferative changes, and when there has been an extensive osteomyelitis, the articular condyle is hypertrophied, as above mentioned, and often continuous with the temporal bone, there being no line of cleavage.

The only treatment for an ankylosed jaw is radical surgery. There are no contraindications except possibly the physical status of the patient. In intra-articular

ankylosis, early age may possibly be a consideration because of the probability of interference with growth by injury, or by destruction of the condylar epiphysis of the mandible. As there is always an irregularity in growth and development of the jaw after ankylosis in young children, it is doubtful that age should be regarded as a contraindication.

Operative measures should not be advised until every evidence of an acute infectious process has subsided. This does not apply to those with a progressive type of polyarticular arthritis, in which cases operative measures are indicated just as soon as practical motion is lost; for not only will this be of value by assuring a proper food supply, but it will also have a beneficial effect on the general process and also by affording access to foci of infection.

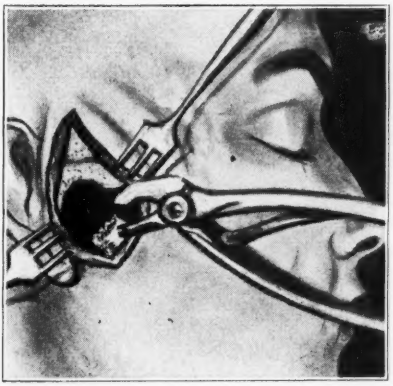

Fig. 5.—End of bone rendered smooth by rongeur forceps or a file.

In other joints, there are certain contraindications to operative measures for the purpose of mobilization, but these rarely apply to the jaw. For instance, it is very doubtful that it is advisable to perform such an operation on an ankylosed joint in which tuberculosis has been the etiologic factor; but tuberculosis is of such rare occurrence in this location as to be of no practical consequence. In fact, I have never observed, nor can I find in literature a single instance of, tuberculous infection of the temporomaxillary joint.

When the ankylosis is intra-articular, the method of procedure is by arthroplasty, the principles of which have been above described. The mechanics of the jaw are different from that of other joints in that the joint surfaces do not approximate after excision of bone. This is prevented by the stabilizing action of the normal joint.

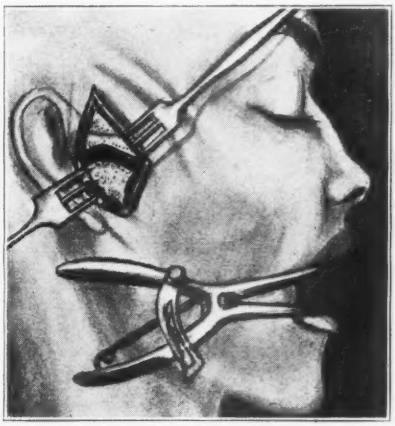

Fig. 6.—Insertion of mouth gag and opening of mouth after operation.

The patient is routinely prepared by shaving the head well over the temporal region. The field of operation, including the external auditory meatus, is cleansed and the external auditory canal is packed with sterile cotton. A general anesthetic is usually employed in all unilateral cases. In bilateral ankylosis, a local anesthetic is preferred though not always necessary. A tracheotomy set should al-

ways be available, although it will be very rarely if ever required with the improved modern methods of anesthesia, since artificial respiration can be carried out through all modern anesthetic apparatus.

TECHNIC

A skin incision is made about one-half inch anterior to the external meatus extending along the zygomatic process for about 1½ inches. Dissection is made to the zygoma, thence below to the ankylosed temporomaxillary articulation. If

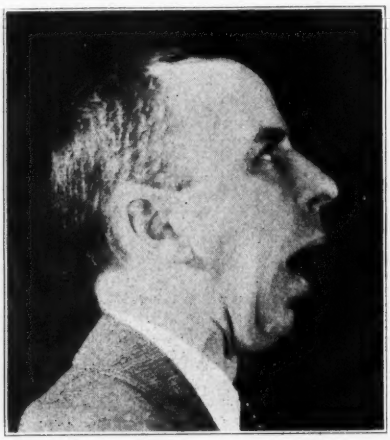

Fig. 7.—Postoperative results following arthroplasty of jaw.

there is not sufficient space to proceed, the skin incision is carried upward for 1½ inches at right angles to the posterior end of the incision. Care must be taken not to sever the ascending branch of the facial nerve that lies just anterior to the external auditory meatus near the main branch, which passes below the temporomaxillary articulation. If a slight incision is made down to the bone and all tissues are then dissected *en masse* from the bone, following the old surgical maxim "keep close to the bone," no structures of importance will be injured.

When the site of the ankylosed joint has been reached and about 1 inch of the condyle has been dissected free from the soft structures, the osseous fusion is broken up with a sharp chisel. Care should be taken not to pass through too far to the inner side as there may be troublesome hemorrhage from the internal maxillary or the internal pterygoid arteries. About one-half to three-fourths inch of bone is excised from the condyle,

Fig. 8.—Postoperative results following arthroplasty.

and the articular extremity is made convex by a file. A cavity made in the temporal bone is rendered even and smooth by a small file or rasp.

The wound is then closed in routine manner and a collodion and cotton dressing applied. No material is interposed between the articulating surfaces as the joint space is preserved by the opposite side as above described. Many surgeons do interpose some material as a fascial

flap or free fascia lata. In the knee and other joints, the interposition of living tissue is essential. This procedure also affords the best chance for success, but it is not necessary, in the jaw.

The after-treatment is most important and must be instituted early. Within a few moments after the operation, if a local anesthetic has been employed, the patient may be able to open the mouth to the full extent, as atrophy of the muscles of mastication is never of the same degree as occurs in ankylosis of other joints, as, for instance, the knee and the hip joint. A gag in the form of a wedge of cork or rubber may be inserted, and in those in whom the range of motion is not sufficient or is decreasing, a pack of ordinary tongue depressors may be inserted, the number being increased daily.

Fig. 9.—Postoperative results following arthroplasty.

Physiotherapy in the form of massage, diathermy and heat, which is employed when possible, is a valuable adjunct. Active use is encouraged and the patient should take regular exercise at stated intervals in the day, the length of time and intervals being regulated entirely by the reaction of the patient. Care must be taken not to induce inflammatory changes, apparent by pain and swelling. The use of the wedge and the exercise should be continued for at least three months; in some instances, six months.

The question often arises as to the physiology of such a reconstructed joint. I have never had the opportunity of incising a jaw in which function had been restored by arthroplasty, but the opportunity has been afforded in a number of other joints, forming the basis of the Sir Robert Jones lecture before the Hospital for Bone and Joint Diseases, to which reference can be made. Animal experiments are of no practical value as it is impossible to secure the intelligent cooperation essential to the restoration of function. In consequence, all of our knowledge must be derived by observations on the human subject.

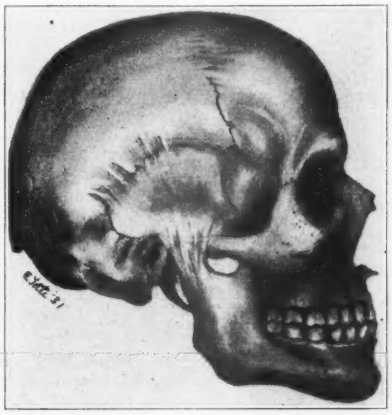

Fig. 10.—Bony ankylosis of temporomandibular joint.

Six joints had been incised for various reasons after the lapse of one or more years, when it was found that a new joint was reproduced with a definite cavity and joint fluid. A section made from the

articular surface demonstrated that the structure from without inward was (1) a dense fibrous tissue layer, (2) a well-defined stratum of fibrocartilage and (3) cavernous bone. In fact, a new joint had been reproduced by Nature, which, in reality, is a counterpart of the same process which we have found after destructive lesions of a joint. Thus, the process is simply Nature's method of repair or reconstruction of a joint. Such a joint cannot be regarded as a normal joint, but in reality is frequently a most excellent substitute.

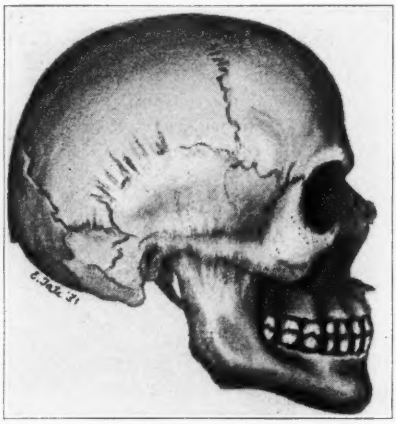

Fig. 11.—Bony ankylosis of entire upper end of mandible including coronoid processes to the temporal and zygomatic bones.

The end-results after arthroplasty of the jaw are most excellent, recurrence of ankylosis being very rare if the technic is satisfactorily carried out. In only one of my cases did ankylosis recur and that was in a man who had extensive osteomyelitis with massive hypertrophy. Sufficient bone was not excised on the deeper aspect and a fusion across this portion recurred. A second arthroplasty gave a most excellent result.

After function has been restored, the ingenuity of the dentist and oral surgeon is required, and when treatment is completed, there is satisfactory occlusion and a more symmetrical contour. If the operation is carried out in the young, Nature also aids in restoring symmetry, as in wry-neck or torticolles, but if the patient is not observed until a more advanced age, the functional results will still be excellent, but, from a cosmetic standpoint, the improvement will not be so great.

There may still be some question as to the propriety of arthroplasty in certain joints, but as the results in the jaw are so good, no person should be permitted to suffer through life from this deplorable condition. By cooperation throughout by dentist, oral surgeon, orthodontist and surgeon, remarkable relief may be expected in practically all cases.

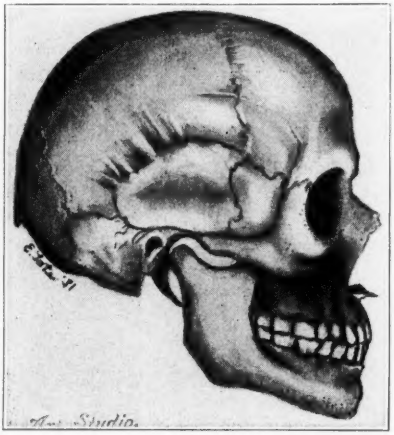

Fig. 12.—Contour of joint after arthroplasty.

DISCUSSION

Aubrey L. Martin, Seattle, Wash.: It is gratifying to have Dr. Campbell come before us to counsel us on the cooperation of different branches of our professions. We have all

seen cases in which the comfort and happiness of the patient would have been increased had the surgeon invited assistance from our ranks. Resections for neoplasms, early removal of sequestrums in osteomyelitis, reduction of fractures with disregard for occlusion, these are some of the conditions that we frequently see. Mobilization of the ankylosed jaw and its treatment as given by Dr. Campbell is a purely orthopedic problem and I as a dentist would be of very little assistance in helping in this condition. Dr. Campbell's paper deals with the true form of ankylosis, and it is interesting to note that in excising the joint, he does not use any interposing tissue such as muscle or fascia. A great many orthopedic men do. Dr. Campbell's operation seems to me to simplify and give a reasonable solution to this problem. It seems that the operation might be regarded more as an excision of the joint rather than as true arthroplasty.

P. G. Puterbaugh, Chicago, Ill.: There is no more pathetic figure than the boy or girl who has an ankylosis of the temporomandibular joint. In most of the cases coming under my observation, the patients have acquired the condition during childhood as a sequel to scarlet fever or other general infectious disease. The clinical picture of almost total absence of a chin, underdevelopment of the lower third of the face and absence of facial expression is uniform and quite characteristic of all cases. Intra-oral examination shows the teeth to be held inseparably in occlusion, wrecked by caries and covered with septic material. The upper anterior teeth are often protruded by the pressure of the tongue, which has wedged a space between the upper and lower incisors similar to that produced by thumb sucking, thus accentuating the grotesque facial appearance. As is the case in cleft palate, an inferiority complex develops as time goes on and the patients assume habits of aloofness from society and adopt a hermit type of existence. Any procedure that will improve the condition is worthy of trial and fortunately the operative results are quite gratifying. Removal of the condyles from the rami as outlined by Dr. Campbell is now generally considered to be the operation of choice. It offers the best results, of course, in those cases where ankylosis is unilateral, because the normal temporomandibular joint maintains the correct relation of mandible to maxilla and guides the affected side to the formation of a new joint in the proper location. Bilateral cases, which are much more difficult to manage, can best be fixed in position immediately after the operation by the placing of arch wires on the upper and lower teeth and holding the mandible forward at night by intermaxillary rubber ligatures adjusted by the patient. The jaw is left free during the day and given passive exercises to maintain mobility of the condyles at the site of operation until fibrous repair has fully taken place. It is important that infection in the field be eliminated before any operative procedures are undertaken. Six months is little enough time for infection to subside after all acute inflammatory symptoms have disappeared. Fortunately, this form of ankylosis is not common, but many victims are permitted to allow the condition to go untreated for years when proper advice would have caused them to seek surgical treatment and have prevented serious and irreparable deformity. Dr. Campbell has, I know, strengthened our faith in the success of surgical treatment of the ankylosed temporomandibular joint.

BILATERAL OCCURRENCE OF IMPACTION OF MANDIBULAR FOURTH MOLARS: REPORT OF CASE

By RALPH W. EDWARDS, D.D.S., Kansas City, Mo.

MISS R. S., aged 21, complained of pain in the lower right third molar area. Intra-oral roentgenography failed to reveal the third molar tooth and an extra-oral exposure was used. The latter revealed a horizontal third molar impaction, and immediately above it in the ramus was the supernumerary fourth molar. In view of the fact that abnormalities of dentition are frequently bilateral, an extra-oral exposure was made of the left side of the mouth, and here, too, an impacted third molar tooth was discovered and above it, in the ramus, the supernumerary fourth molar. Surgical intervention was avoided as the patient was suffering from tuberculosis and could not withstand the shock of operation.

Fig. 1.—Right side of mandible.

Fig. 2.—Left side of mandible.

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C. N. JOHNSON, Editor

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Editorials

COOPERATION BETWEEN THE PHYSICIAN AND THE DENTIST

Much has been said of the desirability of greater cooperation between the physician and the dentist, and more needs to be said. When we consider the intimate relationship between the teeth and the other parts of the body, we must be impressed with the necessity of a perfect understanding between those having charge of the teeth and those dealing with the general system. Not only that, but dentists should recognize the fact that for breadth of vision the palm should be accorded to physicians, owing to the fact that they are called on to deal with a more varied set of conditions than is the dentist. In any specialized effort, there is a natural tendency to narrowness, and this is something that the dentist must seek to avoid. We can learn much from the medical man that will tend to broaden our ideas and make of us better men. Narrowness is the besetting sin of most professional men, as it is of men generally in all walks of life. Thus, the dentist needs contact with other men, and this is particularly true of men having a kindred calling like that of medicine.

But having said this much, we crave the privilege of turning the canvas for a moment and presenting another side to the picture. Because there is another side. While we cheerfully accord to medical men the prerogative of knowing more about the general system than we do, and while we acknowledge that they have greater breadth of vision on most topics than we have, there is one point at which we modestly feel that, in common courtesy and in self-respect, we must firmly and emphatically draw the line. We cannot longer admit that physicians know more about the mouth and teeth than we do, and there has for some years been an unfortunate tendency on the part of certain medical men to assume a superiority of judgment regarding the teeth that has resulted in much real injury to dentistry and much real harm to patients.

Almost ever since dentistry became a profession, there has been a constant endeavor on the part of dentists to interest medical men in the significance of the teeth, with very meager results, be it said, till suddenly Hunter, a physician, in a laudable attempt to clear up infection in the mouth called pointed attention to the teeth as a prolific source of contamination. Then, the medical profession lost its balance and carried many of the dental profession with them. Almost over night, there arose a hue and cry against the teeth as the chief offenders in systemic infection. But the humor of the situation was this—if there could be such a thing as humor connected with a development as tragic as this—the kind of infection that has caused the greatest concern in recent years was never mentioned in any of the pronouncements of Hunter that we have seen. He never referred to focal infection coming from the ends of roots of pulpless teeth, but of sepsis from neglected mouths and from bad bridgework and crowns that harbored around the necks of the teeth accumulations of food débris and probably pus to be carried into the stomach and to cause infection in that way. He pointedly pronounced these crowns and bridges "gold traps of sepsis," and referred to treating the conditions with antiseptic washes to clear the mouth of infection. Apparently, Hunter never had in his mind the kind of infection that has caused most concern during the past decade, i.e., the infection carried into the circulation from the apices of

pulpless teeth. In any event, it is the suspicion arising in connection with the latter condition that has occasioned the greatest concern and incidentally has brought about the worst confusion.

And it is just at this point that we beg to ask for better cooperation between physicians and dentists. Immediately on the advent of the focal infection theory, certain members of the medical profession assumed a knowledge of the teeth that they did not possess, and began to pass judgment on the teeth of their patients without consultation with dentists, with a resultant sacrifice of literally thousands of teeth that were perfectly harmless and that were greatly needed for the performance of their normal function. It is too long a story to tell at this time, but at least this much should be said: The harm that has been done through needless extraction of the natural teeth will far outweigh the undoubted harm that would have resulted from the retention of some of them. No conscientious man wants to minimize the possible injury that may come from neglected teeth, and no one can now say with certainty how much or how little harm has been done; but there is one aspect of the case that needs recognition as between physicians and dentists and that is this: when it comes to a question of passing judgment on the teeth, the opinion of the dentist is entitled to as much respect as that of the physician; and it should even not be called presumption to assert that he is entitled to more respect. He has spent five years in intensive training on this one subject; he has been given a better grounding in the anatomy, materia medica, chemistry and pathology of this particular subject than has the physician, and as to his clinical background, there can be no comparison—he is dealing with the subject every day of his life with an earnest application that compares with that of the most conscientious physician in his particular field.

It will hardly do for the physician to assume that because he has been given a broader training than the dentist, he knows more about the teeth than the dentist does. In the very nature of things, the physician's knowledge of the teeth must be theoretical and speculative, a fact that has only too often been apparent when he has assumed, with the best intentions, to dictate what shall and what shall not be done about the teeth. The dentist does not object to

counsel on the part of the physician when it comes to passing judgment on the teeth, but what he does and should object to is dictation. In a situation where no man actually knows the facts with certainty, it is an exhibition of poor practice and poor taste for the physician arbitrarily to order the extraction of teeth without consultation with the dentist. And this is what has been done in countless cases, too frequently, without the slightest benefit to the patient, and with irreparable harm to the health and efficiency of the patient. If it were within the vision of any man, physician or dentist, to know with certainty what should be done with teeth in question, there might be some justification for assuming an arbitrary attitude, but no man does know, and meanwhile it would seem to be the logical thing for better cooperation and greater tolerance to obtain between the two groups most interested.

AND THE LAST SHALL BE FIRST

At this season of the year when the products of the dental schools have just been graduated and winnowed out by the state boards, and are ready to enter practice, it is sometimes very interesting to note the development, or lack of development, in the various members of any given class. It is probably not generally known how closely the members of a college faculty follow the careers of the graduates that are turned out year after year, but the fact is that the interest manifest by the teachers in the output of each class extends far beyond the day of graduation, and in many cases it lasts through life.

This is as it should be, and incidentally it leads to many intimate and interesting observations regarding the aftermath of college life. It frequently leads to many surprising revelations in the changing personnel of a given class, certain graduates showing a pronounced tendency to constant improvement year after year from the time of graduation, while others show a retrograde tendency dating back from the day that the teaching and disciplinary restraint of faculty supervision is no longer in evidence. It would sometimes seem as

if sheer native ability had little to do with a man's advancement. Too frequently, the bright boy falls by the wayside after a few spasmodic flashes, while the plodder goes serenely on to greater and still greater achievements even though his native ability does not promise much in the beginning.

And this seems to be the lesson of the ages. The persistent plodder who keeps everlastingly at it gains ultimate ascendancy over the man with mere brilliancy of intellect, unless this brilliancy is tied up with a certain amount of patience and perseverance. And somehow it would seem that patience so seldom goes with brilliancy. In a certain sense, brilliancy seems to be almost demoralizing to a man, warping his vision and throwing him off his balance. Almost invariably, the brilliant man takes too much for granted and fails to apply himself. It matters not how bright a man may be, he cannot keep up the pace of progress without a certain amount of application; without, in other words, tuning in on the wavelength of constant advancement and keeping in touch with the march of the most forward-looking events of the hour.

The plodder is usually the safe man. Recognizing his natural limitations, he never loses an opportunity to perfect himself, and the sum total of his ultimate achievement ordinarily carries him away beyond the goal of the man who is naturally brilliant but who is indifferent. In this view of the case, there is much in the way of encouragement. It may not be within the province of everyone to be natively brilliant, but every sentient human being may be a plodder. It requires no unusual endowment of brain power, no genius to startle the world, no ability to move mountains. In the end, the man with perseverance and patience will excel in the race of life, even though his native endowment placed him low in the scale at the start of his career. The last shall be first.

SEND US THE ORIGINAL

Much inconvenience and delay are caused in an editorial office by writers who send in carbon copies of their papers for publication. Anyone with experience must know that to edit a carbon copy and prepare it for the printer is almost an impossibility. This is particularly true when the carbon is typed on extremely thin paper. The type is always blurred and any attempt to make corrections or changes of any kind is disastrous. It cannot be done. Mistakes are too likely to occur at best in printing a periodical, and when to this is added the handicap of indistinct copy, the result is chaos. We have no means of knowing how many unnecessary swear words (we acknowledge the call for necessary ones), heard in a printing plant are due to indistinct copy, but we do not wish to carry on our conscience any more of this species of profanity than we are obliged to. Therefore, please send in the original.

CHARLES EDWARD MEERHOFF, D.D.S.

(1868—1932)

Charles Edward Meerhoff was born in Richmond, Ind., July 6, 1868; died in Chicago, June 6, 1932. He was educated in Richmond and entered the dental department of the University of Michigan in 1886, where he was graduated in 1888.

Dr. Meerhoff came to Chicago shortly thereafter and his entire professional life was spent here. He was initiated into Delta Sigma Delta, Alpha Chapter, in 1887 and was supreme grand master in 1908-1909. He was a Mason and past master of Wrights Grove Lodge No. 779.

He was president of the Chicago Odontographic Society, 1896-1897 and held membership in the Chicago Odontographic, Chicago Dental and Illinois State Dental societies, and the American Dental Association. He was also a member of the Lake Shore Athletic Club of Chicago.

In July, 1900, Dr. Meerhoff married Emma Weigle of Chicago, who survives him. He is also survived by a sister and brother, who reside in Richmond, Ind. A daughter, Helen, died Aug. 31, 1931.

Dr. Meerhoff was an able and conscientious practitioner, with special ability in the finer arts of dentistry, and his place in the profession will be difficult to fill. He was loyal and faithful as a friend, and in all of his associations, in every activity of his life.

CHARLES EDWARD MEERHOFF, D.D.S.
(1868—1932)

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following article has been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association for inclusion in the list of Accepted Dental Remedies. The Council desires dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

FIBROGEN LOCAL-MERRELL.—Suspension of fibrinogen and cephalin for local use.—A sterile suspension of tissue fibrinogen and cephalin, containing 1.5 per cent of tissue fibrinogen and 0.5 per cent of cephalin in a solution of sodium chlorid 0.9 per cent.

Action and Uses.—See Accepted Dental Remedies, THE JOURNAL, February, 1932, p. 325, "Fibrin Ferments and Thromboplastic Substances."

Dosage: Fibrogen Local-Merrell is applied locally, undiluted.

Manufactured by the Wm. S. Merrell Company, Cincinnati, U. S. patent Re. 16,639. U. S. trademark 208,383.

Fibrogen Local-Merrell, 7 C.c. vials.

Fresh beef lungs are finely ground and extracted with 1 per cent sodium chlorid solution. To the filtered extract is added an equal volume of saturated ammonium sulphate solution. The globulin fraction which contains the tissue fibrinogen is precipitated and removed by filtration. A 1.5 per cent aqueous suspension of the globulin is made and sterilized by the addition of mercuric chlorid. The mercury is removed by dialysis. The sodium chlorid content is adjusted to make a concentration of 0.9 per cent. Cephalin, which acts as a stabilizer against loss of activity by heat, is added to the extent of 0.5 per cent. Cresol, which is added to maintain sterility after the container is opened, is added in the proper proportion so that the finished product contains 0.3 per cent. Bacteriologic tests are carried out to insure absolute sterility. The potency of fibrogen local-Merrell is determined by its ability to coagulate recalcified citrated or oxalated plasma and whole blood. When tested by the oxalated plasma method, the clotting time is reduced 85 per cent or more. The clotting power of fibrogen local-Merrell is also regularly tested on fresh whole blood, as follows: Withdraw 10 c.c. of blood from the heart of a rabbit, into an oiled syringe. Transfer 1 c.c. into each of six test tubes, warmed to 37.5 C. in a constant temperature water bath. Add to each of three tubes which are to serve as controls 0.1 c.c. of physiologic solution of sodium chlorid and mix; then to each of the remaining tubes, an equal amount of fibrogen local-Merrell, and mix likewise. The blood in those tubes containing fibrogen local-Merrell shall have solidly clotted within from fifteen to forty-five seconds; whereas, the control blood will clot after from fifteen to twenty-five minutes. The clotting time is thus reduced approximately 90 per cent. The amount of residual mercury after dialysis is determined by the electrolytic method. The amount of mercury present after dialysis is less than 1 part of mercury to 15,000 parts of fibrogen local-Merrell.

MOUTH WASHES

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

The term "mouth wash" is widely used in common parlance, but neither Webster's "New International Dictionary of the English Language" (1929 edition) nor Murray's "New English Dictionary" define the term. Dental and medical dictionaries in general define a "mouth wash" as a medicated liquid used for cleansing the mouth or treating diseased states of the mucous membrane. Such a description does not define accurately such preparations on the basis of composition or differentiate between therapeutic and cosmetic uses. The larger volume of "mouth washes" sold are undoubtedly used for the latter purpose. General usage, therefore, has given a rather loose meaning to the term "mouth wash"; that is, a liquid with a pleasant taste and odor, used to rinse the mouth. Unfortunately, advertisers have attempted to imply wider uses. They may be defined more inclusively as nontoxic solutions or emulsions which are supposed to possess cleansing, healing, astringent, germicidal or antiseptic properties, or any combination of these, depending on their composition. This implies that the solution is not swallowed.

Particularly during the past ten years, advertisers have familiarized the public with a great variety of "mouth washes" or antiseptics, as some of them are labeled, and have fostered the idea that they possess not only powerful therapeutic but also even greater prophylactic potency. This aspect of the problem makes a discussion of "mouth washes" not an easy matter, since such discussion must be guided solely by the available evidence; while it is apparent from even a cursory examination of advertising that advertisers have not guided themselves thus.

One of the pressing problems which confront the Council on Dental Therapeutics is the acceptance or nonacceptance of a considerable variety of mouth washes which have been submitted to it. While admittedly not a direct health problem, it is incumbent on the Council to take some cognizance of the cost of mouth washes. It can hardly be disputed that the public is paying exorbitant prices for many, if not all, of these mixtures. Money so expended could be more profitably applied to health work of proven value. Therefore, it has seemed desirable to take stock of the present situation and to formulate as far as possible a definite policy which the Council may follow with fairness to all. In this report are discussed mainly the bacteriologic aspects of the problem, but, in the choice of agents, physiologic and pharmacologic features must be taken into consideration.

Except for an occasional violation of even common decency, the average "mouth wash" on the market may be stated to be devoid of immediate harm when used merely as a "mouth wash." This statement should not be interpreted rigorously, because, in the final analysis, this must be dictated by particulars. The germicides and antiseptics used are, in the majority of instances, the ingredients on which the most stress is laid for advertising purposes, and which, to a great extent, distinguish the various brands, especially those containing recently discovered drugs with antiseptic action. Many are labeled with therapeutically suggestive names, (Lavoris, Mu-Sol-Dent, F.E.I. Solution, etc.), or a name based on that of some outstanding person in medicine

(Listerine, Pasteurine) or with some other appealing trade name. Most of the names are unfortunately granted trademark protection by the U.S. patent laws. Toxic or caustic antiseptics, even in dilute solutions for general rinsing purposes, are undesirable because the margin of safety between the killing power of such germicides and possible tissue injury is too narrow.

Many of the chemical compounds incorporated into "mouth washes" have a high germicidal value when such value is figured on the basis of the pure compound under certain conditions. It is known that concentration (or dilution) is not always directly proportional to germicidal action, and thus, because a certain compound has a phenol coefficient of 50 as determined by some recognized laboratory procedure, it does not necessarily follow that when it is diluted with 1,000 parts of water, this same ratio holds.

Germicidal tests should be made not only for the concentration of chemical actually found in the "mouth wash" as sold, but, in order to get a truly correct value, tests should be made with the dilution as recommended by the manufacturer and on the actual concentration as found in the mouth during use. Furthermore, for purposes of comparison, phenol, for example, should be dissolved in the same solvent as is used in the commercial preparation. It is obviously unfair to compare water solutions of phenol with alcoholic solutions of some supposed disinfecting agent. In general, this may be expanded to state that comparison of the agent under investigation should be made as far as possible with a well-known prototype described either in the U.S. Pharmacopoeia, National Formulary or other books of recognized standards, under proper dilution and application. For example, it is unfair to compare with phenol a "mouth wash" which is essentially a dilute tincture of iodin solution, when obviously such comparison should be carried out with tincture of iodin properly diluted.

The "phenol coefficient" is a laboratory test tube test. As actually performed, the results are calculated by using the ratio of the dilution of disinfectant to a 1:90 or other designated dilution of phenol, the dilution of disinfectant used for the calculation being that which behaves the same as the 1:90 or other designated dilution of phenol, when both are tested under certain specified conditions, toward the same bacterium. There are at least three methods of determining the phenol coefficient in more or less widespread use.[1] It is important to recognize that both strains and species of bacteria differ considerably in their resistance to phenol, and hence it is necessary to define the particular organism used in referring to the "phenol coefficient." The method for the determination of the phenol coefficient for oxidizing agents and mercury-containing compounds may grossly misrepresent their value under practical conditions. In addition, special tests for antiseptic action and for the penetrating power of various substances have been devised. A test for massive infection was proposed recently.

No method or combination of methods has been devised which will give a thoroughly satisfactory comparison of germicidal agents in a test tube and under the con-

1. Wright, A. W., and Allen, I. S.: Determination of Value of Antiseptics, J. A. M. A., 96:920 (March 21) 1931. Ruehle, G. L. A., and Brewer, C. M.: United States Feed and Drug Administration Methods of Testing Antiseptics and Disinfectants, Circ. 198, U. S. Dept. Agr., December, 1931.

ditions in which they are actually used. When the oral cavity is involved, this is particularly difficult, because quantitative measurements of the number of bacteria in the mouth are impossible. Furthermore, the agar medium so frequently used in determining the number of bacteria removed from the mouth fails to support the growth of some of the important varieties of oral bacteria. Even when tremendous numbers of bacteria are removed from the mouth, there is no way of even roughly estimating the number remaining or the rapidity of replacement. Data purporting to show the decrease in the number of bacteria in the mouth after the use of a particular agent are based on attempts to determine the influence on the bacterial count in ejected saliva on consecutive rinsings with or without mouth washes. The results obtained by such methods are not entirely convincing, because no information whatever is afforded as to the kind or number of viable bacteria remaining in the mouth.

Claims are not infrequently made concerning the penetrating power of mouth washes. Sometimes, those refer to ability to enter far into wounds resulting from operative procedure; at other times, the conclusion is that penetration into the healthy tissue takes place. These two points of view may or may not be related. The laboratory tests available for comparison of this supposed property of disinfectants and mouth washes are based upon the ability of the chemical or mixtures of chemicals to penetrate an agar jelly and either to inhibit bacterial growth or to actually kill the organisms. Here again, practical conclusions are drawn on the basis of laboratory data obtained under conditions which are not comparable with those found in the mouth. There is also a lack of uniform opinion among bacteriologists as to the relation of surface tension to disinfecting power.

As these are *in vitro* tests, it is obvious that the results and their various modifications cannot be applied to actual use unless the conclusions drawn therefrom are accepted with mental reservations. The presence of body fluids and tissues may cause a change or even conceivably result in checking germicidal activity. In the mouth, for example, the bacteria capable of doing harm are those located in the crypts and folds of the mucous surfaces or attached to the teeth and gums, which are covered with saliva and other secretions. The question may properly be raised: What chance has a "mouth wash" of coming in contact with these bacteria? The ones floating around in the saliva, which might be acted on by the antiseptic, are already on their way out of the mouth. In the case of "gargles," the situation is even more ridiculous, for a "mouth wash" used as a gargle will reach only the anterior fauces. They do not reach the posterior fauces, nor will they come in contact with the bacteria which are in the crypts of the tonsils or in the folds of the nasal pharynx. Unfortunately, this obvious difference between the action on or in the human body and the germicidal activity in the test tube is not recognized or is overlooked by the advertising departments of commercial firms promoting the sale of "mouth washes."

In view of the lack of evidence brought forward by the exponents of the indiscriminate and general use of "mouth washes," it may be stated categorically that the general use of "mouth washes" can be considered to serve no more intrinsic purpose than as an aid in the mouth toilet in the removal of loose food and débris; and that the main action appears to be due to mechanical rinsing. It may be stated with equal emphasis on the same grounds that the average mouth of the normal person has not been shown to be in need of medicated "mouth washes"; that is, "mouth washes" that

contain ingredients with active medicinal properties, such as astringents, protein precipitants, germicides of the phenol type and active chlorin.

The dental profession, on the other hand, uses the "mouth wash" with the realization that its most important application is as a rinsing agent. Under certain conditions, it may be of value because of germicidal, antiseptic or therapeutic properties which can be utilized in dental practice, as in postoperative procedure, but its successful use in this connection depends on a number of factors, such as the agent, method of application, time and accessibility of the parts.

In appreciation of these facts, the Council has already taken the position that as far as germicidal activity in the oral cavity is concerned, there is no evidence that "mouth washes" as they are commonly used do anything more than cause a temporary decrease in the number of bacteria in the mouth. "The use of such terms as 'germicide,' 'antiseptic, and 'disinfectant,' in advertising 'mouth washes' are definitely misleading. Laboratory tests cannot and do not show the value of any disinfectant under practical conditions." This general statement is not to be interpreted as implying that the application to localized areas of certain medicinal agents possessing antiseptic properties *in vitro,* with an appreciation of the other factors concerned, is without benefit. As an example, the circumstances that surgical solution of chlorinated soda (Dakin's) is useful in the treatment of open wounds under carefully defined conditions does not mean that the superficial application as in a "mouth wash" is equally useful, may be cited.

Many of the "mouth washes" sold are permitted to be labeled "antiseptic" not because they are antiseptic under conditions of use, but because they comply with an arbitrary test of the Food and Drug Administration of the Department of Agriculture, adopted as a guide in the enforcement of the Food and Drugs Act. Hence, the circumstance that a proprietary "mouth wash" is labeled "antiseptic" or is advertised as an antiseptic must be accepted with a grain of salt because of the number of factors that one must consider in reaching a sound estimate as to their usefulness in any given condition. The test of the Food and Drug Administration for soluble disinfectants is based on the reaction of a medium to *Bacterium typhosum,* a type of bacterium not ordinarily found in the mouth; or *S. aureus* may be used for testing washes, mouth washes, gargles, douches, etc.

In practice, it is possible that pathologic conditions may be alleviated by the use of these so-called germicidal or antiseptic solutions, when accompanied by suitable operative or mechanical procedure; but, unfortunately, no carefully controlled tests to determine the influence of the "mouth wash" on the end-result are readily available. On the other hand, it is apparent from the experiences of some that pathologic conditions may not be benefited by the indiscriminate use of "mouth washes." For example:

> In the treatment of chronic periodontoclasia, no mouth wash is necessary, and its use often takes up time, energy and interest that should be devoted to the brush. Following instrumentation, the use of normal saline, warmed to about body temperature, is to be recommended, but aside from this, no mouth wash should have any place in mouth hygiene practice.[2]

The use of liquids covered by the term "mouth wash" in the dental office is largely limited to their employment as a pleasant tasting solution for gargling

2. Lyons, Harry: Chronic Periodontoclasia—Its Etiology, Pathology, Diagnosis and Treatment, Bull. Virginia D. Assn., January, 1932, p. 62.

and spraying purposes after operative intervention. Their use adds to the comfort of the patient, possibly because of the appeal of their taste and color and, in this way, they may be considered to have a legitimate though extremely limited place. For this purpose, water, with or without saccharin and essential oils as flavors, will no doubt fill every legitimate need; or, if one desires something more, saline solutions of "normal" strength (i.e., 0.85 per cent sodium chlorid, 2 teaspoonfuls [2 drams] in a quart of water, will yield approximately a 0.9 per cent salt solution), flavored if desired. Their usefulness will depend in part on the force with which they are sprayed into the mouth and thus remove loose material by mechanical means.

"Mouth washes" as they are used by the laity cannot be considered any more useful than as they may act mechanically and for this purpose plain water or salt solutions are adequate. The gargle and swishing of the liquid in the throat or mouth may act mechanically to remove mucus lodged in the throat, which may be a cause of congestion, and to remove loose food débris.

The claim that "mouth washes" remove mucin films is too remote to warrant serious consideration. The same statement applies to neutralization of mouth acidity and to the discovery of dictionary students, "halitosis." The claimed "purging" action is apparently no more than a play on mechanical removal of loose débris, but the inferences that readers or hearers are permitted to draw from this action cannot be condoned.

At the time this report is being prepared, the most important medical claims made to the public who are asked to purchase and use "mouth washes" are related to the prevention and cure of colds. The claim is not necessarily a direct one, but the fact that the public makes these inferences does not detract from the insidiousness of the sales talk, nor does it relieve the manufacturer of moral responsibility. No scientific evidence is available that mouth washes are factors in the prevention or cure of diseases of the upper respiratory tract, such as colds, influenza, tonsillitis and bronchitis.

Several products in powder or other solid form have been advertised with directions for making a mouth wash and for its use as such. It is obvious that such materials dissolved in water come under the general designation of "mouth washes" as far as the directions on the label or in the advertising apply to such usage. In this case, the statements made above in relation to mouth washes already in liquid form apply. All other things being equal, it is conceivable that this might be a more economical form since the user draws the water from the faucet and does not have to pay for water which is already bottled.

To summarize: The only legitimate use of a "mouth wash" to the general public is as an adjunct in the toilet of the mouth, to make the mouth temporarily taste pleasant. To the dentist, the "mouth wash" may be used for the foregoing purposes. In addition, it may also be part of postoperative treatment, but its use for this purpose should be conditioned on adequate and rigorously conditioned data.

The Council presents the following summary of its position: Many use "mouth washes" because of the pleasant feeling they supposedly impart when employed as part of the mouth toilet, and this use may be considered to be in the same category as the use of talcum powder by men and women; that is, as cosmetic agents. For this purpose, a "mouth wash" should satisfy two main essentials: it should be harmless

when used over a long period, and the user should not be led to believe that the "mouth wash" possesses imaginary properties of giving health to the mouth, body or dental apparatus. The general use of such preparations entails a loss of resources that might better be used for more worthwhile public health work.

MANUFACTURER OF PYO-REM FINED

The Food and Drug Administration of the U. S. Department of Agriculture has just completed a court case in Los Angeles against the product known as "Pyo-Rem."

This preparation was labeled as "Useful and beneficial wherever an Astringent Mouth Wash or Gargle may be indicated." Then, in a second portion of the label, it stated in red "Pyorrhea, Alveolaris (Rigg's Disease), Tender, Bleeding, Soft, Spongy, or Receding Gums," "A Real Tooth Saver." The article consisted essentially of zinc chlorid, potassium chlorate, boric acid, alcohol and water.

The district court judge found the manufacturer guilty on the allegations and imposed a fine of $50.00 on each of the counts.

Drs. Baughman, Buckley, and Endelman testified for the Government.

BUREAU OF PUBLIC RELATIONS

THE CINCINNATI MOUTH HYGIENE CAMPAIGN*

RADIO

(E. L. Ball, Chairman)

THE chairman of the Committee on Radio and the general chairman held conferences with representatives of the Crosley Radio Corporation regarding the possibility of securing time over their station. A ten-minute period at 11:15 a. m. each Wednesday and Thursday was assigned for talks on mouth hygiene, this being an hour when many mothers listen to the radio. During the month of October, Dr. Bell arranged for talks by officers of the Cincinnati Dental Society. In November, the secretary of the general committee took over the arranging of appointments and talks under the direction of Dr. Ball.

Forty-seven talks were given, of which twenty-two were original. Others were adapted from the material furnished by the American Academy of Periodontology, radio talks published by the American Dental Association and other sources. Questions were requested and were answered over the radio and by letter. About thirty questions were received.

All but five of the talks were given by members of the Cincinnati Dental Society. These were given by George H. Wandel, Supervisor of the Bureau of Public Relations of the American Dental Association; Martin Dewey, President of the American Dental Association; E. H. Schoenling, health commissioner of Hamilton County; Carl Wilzbach, director of health education, Public Health Federation, and Miss Anna M. Drake, assistant secretary, Public Health Federation.

It was planned to make the talks educational and consecutive without undue repetition of information. During the intensive campaign week, the periods were increased to one each day except Friday, the talks describing dental programs being carried on in Cincinnati and Hamilton County. On the suggestion of the program manager, the introduction was rewritten from time to time for the sake of variety.

The staff of the Crosley Radio Corporation handled the programs in a very efficient and courteous manner. The dentists gave their time freely in writing or reviewing their talks, were prompt in appearing at the station, gave excellent performances and put forth a sincere effort to make this feature of the campaign successful.

In addition, announcements were made over stations WKRC and WFBE during the intensive campaign week.

Following is a list of subjects given over the radio and the names of the speakers. The talks "American Dentistry" were taken from "Devils, Drugs and Doctors," published for the radio by Howard W. Haggard.

*This article is continued from the June issue of THE JOURNAL. Others will follow until the complete story is told.

October

The Mouth Hygiene Campaign[1]
Carlos H. Schott
Teeth and Their Relation to Health[1]
William F. Vosseler
The Development of Teeth[1].....E. R. Cumley
What the Public Dental Service Society Is Doing to Prevent the Extraction of Teeth[1]
E. H. Jones
How to Brush the Teeth[2]....H. J. Niedhamer
Poor Health or Good Health[1]..A. H. Fulkerth
Cancer Control[1].....C. H. Burmeister
General Work Done in Cincinnati[1]
Sidney J. Rauh
The Baby's Invisible Pearls[2].....Leon Saks
Mothers Need Not Lose Teeth[2]..C. H. Stricker
Why We Have Teeth[2].....H. M. Cormany
Knowing His Teeth[2].....C. J. O'Donnell
Nature Does a Good Engineering Job[2]
P. K. Phillips
Hanging on to Life by the Teeth[2]
R. G. Harkrader
Thanksgiving Theme[1].....J. A. McPhail

December

The Teeth and General Health[1]
George H. Wandel
Talk[1].....Martin Dewey
Could Solomon Understand Tooth Paste?[2]
V. B. Dalton
Say It Without Tears[2].....William Smith
Good Teeth to Last a Lifetime[2]....Carl Henn
Taking Fifty-Two Chances with One's Life[2]
Paul Cassidy
Tartar or Stone in the Mouth[2].....E. J. Roche
Pyorrhea—What Is It?[2]....McConnell Craig
Door Knobs and Strings[2]....W. F. Grossman
Our Children's Teeth[1].....Dillion M. Routt
Keystones of the Arch[2].....Marie L. Beckert

January

Economic Factors in Dentistry[1]
Henry E. Germann
Dulling Father Time's Scythe[2]
M. C. Schuman
Care of the Child's Teeth[2].....Fred W. Black
Brushing the Teeth[2].....C. J. Hudson
Selection and Care of the Tooth Brush[2]
E. J. Harkrader
Habits Which Cause Irregularity of Teeth[2]
D. W. McKinley
Home Care of the Child's Mouth[2]
Herman L. Pastor
The Time to Straighten Crooked Teeth[2]
W. O. Hulick

February

American Dentistry, I.....H. C. Jarvis
American Dentistry, II.....H. C. Matlack
Preventing Illness by the Care of the Mouth[2]
Walter E. Erhardt
Care of the Teeth[1].....Carl Wilzbach
Why Dentists Do not Advertise[1]
Hugh W. MacMillan
Diseases of the Mouth[1]....James A. Hartman
Care of the Mouth from 12 to 20[1]
R. B. Stephens
A Tooth for Every Child[1]...Anna J. Heymes
Summary of Dental Talks....Oscar Helmling

Intensive Campaign Week

Dental Service in the Cincinnati General Hospital and Its Outpatient Department[1]
J. P. Becker
The Public Dental Service Society[1]
E. H. Jones
Dental Service of the Hamilton County Health Dept.[1].....E. H. Schoenling
Other Dental Services in Cincinnati[1]
Miss Anna M. Drake
Is Cincinnati Mouth Hygiene Conscious?[1]
Sidney J. Rauh

1. Original paper.
2. Indicates talks adapted from material prepared by American Academy of Periodontology or radio talks published by the American Dental Association.

Radio Announcements.—The following are samples of forms used by radio announcers in introducing speakers and in "signing off."

We are sure that there are a great many questions which you would like answered regarding your teeth and their care. Just write to the Mouth Hygiene Question Box, in care of WLW, Cincinnati, Ohio, and you will hear your answer on the air. A self-addressed, stamped envelope will bring you an answer by return mail. Let's know more about our teeth!

"Nature's jewelry—pearly teeth" is the slogan adopted for a mouth hygiene campaign being conducted in Little Rock, Ark. The Cincinnati committee has not officially adopted a slogan, but this is one it might well use: "Cincinnati, the best governed city—let's make it the one with the best teeth," for that is what we are trying to do.

These radio talks are a feature in a campaign being carried on by the Houth Hygiene Council of the Public Health Federation and

the Cincinnati Dental Society. This time every Wednesday and Thursday, 11:15 a. m., is given by the Crosley Radio Corporation to one of its educational programs. Listen in and learn from reliable sources how to care for your teeth and your children's teeth. This morning we have the twelfth in the series, a talk by Dr.....on.....

That was Dr....., speaking in the Mouth Hygiene Campaign radio series. Are there any questions which you would like answered regarding your teeth and their care? Just write to the Mouth Hygiene Question Box, in care of WLW, Cincinnati, Ohio, and you will hear your answer on the air, or a self-addressed, stamped envelope will bring you an answer by mail. Let's know more about our teeth!

How are your teeth? And how are your children's teeth? Studies made in various parts of the country show that 95 per cent of children have decayed teeth. Can decay in children's teeth be prevented? It certainly can, and this series of radio talks tells *how* it can be prevented, as well as giving other authentic information on the care of the teeth.

This is part of a mouth hygiene campaign being carried on in Cincinnati and Hamilton County by the Mouth Hygiene Council of the Public Health Federation, cooperating with the Cincinnati Dental Society and one of its committees, the Public Dental Service Society.

This period is donated by the Crosley Radio Corporation as one of its educational programs. This morning, we have the.....in the series, a talk by Dr.....on.....

We are now to hear the last in a series of .....educational and information talks on the care of the mouth.

During the next week, at 11:15 every morning, these talks will give information regarding dental programs being carried on in Cincinnati. These talks are a feature in a mouth hygiene campaign being conducted under the auspices of the Mouth Hygiene Council of the Public Health Federation, the Cincinnati Dental Society and its committee, the Public Dental Service Society, the time being contributed by WLW as a part of their educational program.

Today, Dr.....summarizes the information that has been given in these radio talks.

A copy of the letter to dentists asking them to give radio talks follows:

Cincinnati, Ohio.
Dec. 10, 1931.

Dr. McConnell Craig,
1508 Harrison Ave.,
Cincinnati, Ohio.

My dear Dr. Craig:

As you probably know, a mouth hygiene campaign is being conducted in Cincinnati, one feature of which is talks over WLW by members of the Cincinnati Dental Society. These talks are being given every Wednesday and Thursday morning at 11:15 o'clock, from the WLW studio in the Netherlands Plaza Hotel, Parlor Q, fourth floor.

Dr. Ball, chairman of the Radio Committee, would like very much to have you give the talk on Wednesday, December 23.

In order to avoid repetition and to furnish continuity, the committee is supplying material for the broadcasts, using a series prepared by a committee from the American Academy of Periodontology. If you will consent to speak on the date mentioned, I will be very glad to send you the material and further details.

Trusting that I may hear favorably from you, I am

Sincerely yours,

Secretary.

A copy of the letter of instructions to dentists re radio talks follows:

Cincinnati, Ohio.
Dec. 11, 1931.

Dr. McConnell Craig,
1508 Harrison Ave.,
Cincinnati, O.

My dear Dr. Craig:

You are scheduled to speak over Radio Station WLW, Wednesday, December 23 at 11:15 a. m. You will broadcast from the downtown studio in Parlor Q, on the fourth floor of the Netherlands Plaza Hotel.

You are requested to be at the broadcasting station at 10:45 a. m. in order that your voice may be tested and everything in readiness, as a radio program must move along promptly.

Attached herewith you will find your talk, entitled "Pyorrhea—What It Is."

Ten minutes is allowed for this period. The announcer will take half a minute at the beginning and a half minute at the end in which to introduce you and give the sponsors of the program. This will leave nine minutes for

your talk. When you have finished, the announcer will read a notice regarding questions being sent in.

Fraternally yours,
EDWARD L. BALL, *Chairman,*
Radio Committee.

SCHOOL WORK

(E. H. Jones, Chairman)

As supervisor of the Public Dental Service Society, Dr. Jones was made chairman of school activities in connection with the mouth hygiene campaign.

Class Room Activities.—Early in the fall, a letter was sent to the director of health and physical education suggesting that he endeavor to promote special interest in the care of the mouth in the regular health program and enclosing an outline of activities for the classroom, for the health period and for special intraschool projects, such as health plays and parades. The superintendent of schools, Mr. E. D. Roberts, gave permission for talks and for motion pictures to be shown in the public schools by Miss Evelyn C. Schmidt, representative of the Colgate Company. Miss Schmidt was formerly with the educational department of the American Dental Association. She had excellent motion pictures and gave very interesting and instructive talks in ninety-three schools, remaining in Cincinnati from Sept. 21, 1931, to January 15, 1932, inclusive. She reached sixty-eight public schools, or a total of 38,750 children and twenty-five parochial schools, or 7,701 children. There were 142 programs given in public schools and twenty-six in parochial schools. A letter of appreciation for Miss Schmidt's service in the schools was sent to the Colgate Company by Mr. Roberts, superintendent of schools. The Public Dental Service Society also distributed suggestions for observing mouth hygiene education in the schools.

High School Dental Examinations.—Again with the consent of Mr. Roberts, plans were made for the examination of the teeth of all high school pupils. Letters were sent to principals asking their cooperation in this project and requesting that they name a date that would be convenient for them. C. J. O'Donnell was appointed chairman of the Comittee on Volunteers and he, in turn, appointed fifteen men to serve with him. This group divided the dental society membership and each member was reached by telephone, with the result that 145 men volunteered for service.

The office of the Public Dental Service Society arranged the dates of the examinations and booked the dentists for volunteer service. More than 9,400 pupils were examined, in ten high schools.

The examinations were made with mouth mirrors but without an explorer, one item especially observed being the presence or absence of the first permanent molars. Principals scheduled students from the various rooms for the examinations so that the dentists worked continuously.

For each dentist, there were two chairs, a table, two pans for finger bowls and two tall glasses for mouth mirrors, with compound solution of cresol (lysol) in one pan and one glass and clear water in the others. Examination forms for writing purposes were attached to wallboard with thumb tack. Attached were copies of letters to principals, the instructions given dentists and the records used to enter a detailed report of the examinations. In addition to the work done by volunteers, students in Walnut Hills High School and Withrow Junior High School had dental examinations arranged for and financed by their parent-teacher association.

Poster Contest.—In December, a poster contest was launched in the public and parochial schools. Mr. William

Vogel, director of art in the public schools, was much interested in this project and gave excellent advice on the requirements for the contest, the classification of posters, etc. Prizes of $5, $3, $2 and $1 were given to contestants in the three classes of school: high, junior high and elementary. For judges the committee appointed Mr. Vogel, Dr. Jones, Mr. William S. Groom of the Thompson-Koch Advertising Co. and Mr. Jack Storey of the Central Academy of Commercial Art, representing, respectively, art, truthfulness of the idea, advertising value and design. More than 100 posters were submitted, about twenty-six securing prizes. The posters were used in window exhibits and were displayed in the central and branch libraries.

SUGGESTIONS FOR SCHOOL PROGRAMS EMPHASIZING MOUTH HYGIENE

I *Class Work.*—Refer to "Health and Physical Education" series of the State of Ohio Department of Education, Vol. I and II, under "care of teeth"; also "Health Training in Schools" by Dansdill, under "teeth," page 262, and to other books and courses for school health.
  (A) Have pupils make posters and booklets and compose rhymes, songs and stories.
  (B) Arrange an exhibit of foods that help to promote good teeth by building (lime, etc.), keeping gums healthy (fruits) and affording exercise for teeth (crusts, green vegetables, etc.). The exhibit may be of real foods or pictures cut from magazines.
  (C) Arrange a display of toothbrushes and inexpensive dentifrices.
  (D) Have a dentist or nurse give a talk and demonstration on the care of the teeth.

II *Stories.*—The Brushes Quarrel, "Health Training in Schools and Healthy Living," Vol. II, on the subject of mouth hygiene.
"Magic Pearls" and "Old Grouchy Man Toothache," from "Health Training in Schools."
"The Teeth that Jack Built" (National Dairy Council).

III *Plays.*—Who says six year molars? (National Dairy Council).
"The Road to Grown-up Town" and "A Trip to Healthland," from "Dramatizing Child Health."

IV *Songs.*—Round song, "Clean, clean and neat," from "Dramatizing Child Health."
"This is the Way We Brush Our Teeth."

V *Poems.*—See page 208, "Health Training in Schools," published by Joint Committee on Health Problems in Education.

VI *Booklets.*—"Care of the Teeth" (Metropolitan Life Insurance Co.).

VII *Intraschool Activities.*—Arrange a dental health parade, subjects being assigned to each grade for demonstration or display, as daily care, diet, visits to dentists, results of good care and results of poor care.

PUBLICITY

(Sidney J. Rauh, Chairman)

To this committee was assigned not only newspaper publicity and other printed forms of educational material, but also displays planned for the intensive campaign week. As plans developed, subcommittees were appointed to take charge of the displays in (1) drug stores; (2) grocery stores, and (3) department and vacant store windows.

Newspapers.—This work was handled by Sidney J. Rauh, chairman of the Committee on Publicity and through the office of the Public Health Federation. One of the first items planned was a series entitled "Folklore or Science in the Care of the Teeth." In this series, an ancient practice in the treatment of the mouth (as given in "Folklore of the Teeth," by Leo Kanner, M.D.) was compared with the scientific method of caring for the same condition. This series was accepted by the *Times-Star* and run at intervals of about a week in a prominent location in the paper with a large heading and box.

The second regular feature was notices

of talks given by dentists to mothers' club. On the day previous to each talk, a notice was sent to each newspaper, giving the name of the dentist, the name of the mothers' club that he was to address and a brief excerpt from his talk.

Articles were prepared and sent to house organs, suburban newspapers and trade journals. Reports of the progress of the committees and the launching of new projects were sent to the papers. Three editorials in two papers emphasized the importance of the campaign.

Miss Georgia Elliston, of the *Times-Star,* became greatly interested in the project and wrote many feature articles. Some of the features were:

1. An eight-column cut showing a dental assistant demonstrating with a giant toothbrush and jaw bone the proper way to brush the teeth.
2. The prize posters of high school pupils, with the names of the winners.
3. An attractive picture of a mother helping a 4-year-old child to brush her teeth.
4. A Ziegfeld Follies girl before the food display in the Kroger Grocery Company quoted as discussing the importance of food and teeth.
5. Photographs of the dental hygienists who demonstrated the care of teeth in store windows during the intensive campaign week.
6. A photograph of the dentists examining the teeth of high school pupils.
7. A picture of a group from a children's home singing a toothbrush song.
8. A story on a skit entitled "In the Dentist's Waiting Room," which was given at a dinner.
9. A story on the letter received by the committee from President Hoover approving the campaign.
10. A feature article on the history of dentistry, bringing out the fact that Paul Revere practiced dentistry and comparing the dental care given the men on the Byrd expedition with the probable care of Columbus' crew.

The committee appreciated greatly the space given to their activities by the newspapers, particularly the *Times-Star.* It is doubtful that, with a paid publicity agent, more interesting publicity could have been secured.

Short articles were submitted to house organs, suburban newspapers and trade journals and a fair number of articles appeared.

The publicity director of the Cincinnati Street Railway Company was consulted regarding the possibility of displaying a reproduction of the prize poster on the outside of street cars. It seemed that this could not be arranged, but a notice of the intensive campaign week was included in a bulletin of special activities during February displayed in front inside the street cars. This notice gave the date of the intensive campaign week and suggested that adults visit their dentist and take their children to the dentist as well.

Drug Stores.—J. J. Wittenberg was chairman of the committee on drug store publicity. The idea of having displays in drug store windows was one of the first considered by the committee on the intensive week campaign. Letters were sent to twenty-two manufacturers of toothbrushes, tooth pastes, mouth washes, etc., telling them that a mouth hygiene campaign was being launched in Cincinnati, giving them the date of the intensive campaign week and asking for their cooperation in educational displays in local drug stores. In most instances, their replies were not what was expected. The committee had in mind that these companies would look on this as an opportunity to make a special display of their products, but this was not the case. In a few instances, the idea was well received and carried out.

In order that the same message be given with every display, a window card was prepared and 1,500 were distributed.

The chairman of the committee ad-

dressed the Retail Drug Association and secured their interest. Representatives of the Dow Drug Co. were seen and their cooperation was assured. Representatives of other chain drug companies were interviewed and in all instances the idea was well received.

In January, J. J. Wittenberg was appointed chairman of the subcomittee to do some intensive work with the drug stores. His first contacts were with the wholesale drug companies. The McKesson-Vogeler Drug Company offered to distribute window cards to be used in the displays. This company also sent letters to druggists enclosing one from the Cincinnati Dental Society, urging drug stores to arrange window displays of articles used in the care of the teeth, such as mouth washes, dentifrices and toothbrushes. An interesting feature of this letter from the McKesson-Vogeler Company was a P.S. to this effect: "A reproduction of their (the Cincinnati Dental Society) letter to us is attached and, as we said above, this is the *official* Dental Society of Cincinnati." Another wholesale drug company gave valuable assistance in arranging windows. The Cincinnati Window Display Company also assisted local stores in arranging attractive windows.

The problem of getting window cards to drug stores other than those on the list of the wholesale drug company which distributed cards to their patrons presented itself. At a special meeting of the committee, members volunteered to call dentists living in various sections of the city asking them to spend an hour or two on Saturday delivering window cards. About thirty dentists took part in this activity, distributing from ten to fifteen cards each.

As far as we have been able to ascertain, no portion of the city missed having drug store window displays emphasizing mouth hygiene. The Hy-Pure Company, with stores in Cincinnati, Newport and Covington, had a display in each of its eighty-two stores; the Dow Drug Company in each of its thirty-three stores. Squibbs, Colgate, Calsodent, Kolynos and other manufacturing companies assisted drug stores in arranging displays of their products in from twenty-five to fifty stores each. The Cincinnati Display Company arranged displays in fifty stores.

Groceries.—H. C. Jarvis was chairman of publicity in grocery stores. In considering window displays to emphasize the care of the mouth, it occurred to a member of the committee that displays of food essential to healthy teeth could be made attractive and of great educational value. The chairman interviewed the director of the Research Foundation of the Kroger Company, who expressed his interest in the project and his willingness to cooperate.

H. C. Jarvis was appointed chairman of a subcommittee to go farther into the subject of food displays. He first compiled a list of foods important to the health of the teeth. This list was reviewed by a committee and submitted to Miss Eleanor Maclay, professor of nutrition at the University of Cincinnati, who added to it and classified it, basing her selection on calcium content and the presence of vitamin C. She also gave valuable advice regarding the arrangement of displays. The list was then submitted to Mr. Ryan for further comment. The project was presented at a meeting of the Retail Grocers' Association, who gave its approval. A letter to grocers requesting their cooperation and enclosing the list of foods with suggestions for displays was mailed to each of the 800 members of the Retail Grocers' Association from their office.

Several excellent windows were ar-

ranged, but the number of grocery displays was probably lower than that of drug store displays. One of the displays on Fountain Square was the basis of an excellent newspaper article, featuring a Ziegfeld Follies girl and her comments on food for healthy teeth.

In order that the message regarding foods should be uniform, a special card was prepared for grocery stores. The chain grocery companies, such as Kroger, Burke, Schneider, Voss and A. & P., placed these cards in their stores and they were distributed to independent stores by various means.

The Burke Grocery Company, with fifty-six retail stores, arranged displays and gave valuable assistance. For one week prior to and through the intensive campaign week, the mouth hygiene campaign was mentioned during its daily broadcast to housewives.

Restaurants.—In considering displays of food good for the teeth, Dr. Jarvis interviewed the manager of Mills' Cafeteria and found that about 1,000 people a day are fed there. The manager was interested in the possibility of aiding in the campaign and suggested that a table could be provided near the entrance upon which a leaflet giving a list of foods important to dental health might be available. Owing to the lack of time in which to prepare an attractive and suitable leaflet, this idea was not carried out.

The executive secretary addressed the Restaurant Owners' Association and asked its cooperation in the campaign, suggesting ways in which restaurants might cooperate. With the approval of the association, a letter was sent to its members giving this suggestion: that they include in their menus foods mentioned in the list either by starring items or by suggesting menus including these foods. We have no way of knowing whether any restaurants followed this suggestion. This was an idea that occurred too late in the campaign to be followed up, but it is passed on as one having possibilities.

Department Stores.—In addition to the displays in drug and grocery stores, the committee arranged for educational displays in department store windows. Arrangements for displays in department stores were made by Dr. Rauh and the executive secretary. All but two of the large department stores in the city gave window space or arranged their own displays. Of particular interest was the display of the Big Store, which carries supplies for the Boy Scout organization. This window represented a camping scene, showing two Boy Scouts, life size, in uniform, preparing to brush their teeth. The campaign window card was displayed, hanging on a tree in the foreground. The silver cup that will be awarded to the Scout troop winning the "Better Teeth" contest was also displayed. Hanke's Department Store provided a window in which a dental hygienist demonstrated the cleaning of teeth. Alms & Doepke's window showed the figure of a dental asistant in uniform. Other stores displayed dentifrices, toothbrushes and prize posters, some of them adding other educational material.

Vacant Stores.—E. J. Roche was chairman of publicity in vacant stores. Twelve vacant store windows were secured and permission given to display exhibits. In one of the better windows, a dental hygienist demonstrated the care of teeth. A very interesting window was used for the display of an attractive school scene, containing a blackboard and cutout figures of pupils and teacher, the blackboard and children's slates giving instructions on the care of the teeth. This was secured from the Children's Bureau. One or two additional posters and the

Mouth Hygiene Campaign window card combined to make this a very atractive display.

Other displays included a series of large models prepared by a committee from the Cincinnati Dental Society and used extensively in educational work. This was combined with commercial posters and posters submitted by the school children. The National Dairy Council furnished valuable material for window displays. These included ten three-leaf screens showing a display of foods good for teeth for children from 6 to 16, a boy and girl of high school age calling attention to the importance of good teeth and the campaign window card; and mechanical devices showing the importance of milk in the building of teeth, and a variety of attractive posters. Large models of jaws, teeth and toothbrushes combined with posters and signs were used in other windows. Surgical supply houses displayed equipment for dentists and educational material on the care of the teeth.

SCIENTIFIC EXHIBITS FOR THE RANK AND FILE*

By GEORGE H. WANDEL†, D.D.S., Chicago, Ill.

ONE of the greatest blessings of mankind is the ability to see. From the very beginning of man's development, sight has been one of the principal factors in his progress, and it will, of course, always hold a vital place in the field of education. The science of medicine, of which dentistry is a part, depends largely on this one sense. S. H. Daukes, director of Wellcome Museum of Medical Science, says, "In clinical work, the eye is the main avenue for diagnostic information, to which the senses of touch, smell and hearing are supplementary. In medical education, again, the eye must also take first place; it is from the wealth of material stored as visual impressions that the expert draws his comparisons and conclusions."

How true this is in the field of dental practice! We depend on those pictures which we retain in our minds when we must distinguish disease, actual or incipient, from the normal; we realize the value of vision in those finer points of restorative technic which involve color, contour and size, and, finally, in operative and restorative procedures, we appreciate the possibilities in delicacy and accuracy of touch when associated with good vision as compared to the pain-producing and inaccurate workmanship which invariably results when vision is in any way impaired. When we think back over the professional training and knowledge that we have obtained, we realize that its acquisition was largely dependent on the sense of sight. What held true when we were undergraduates will continue to hold true long after we have ended our professional careers.

As undergraduates, few of us fully ap-

*While this paper is a discussion of the scientific exhibit, the principles outlined are just as applicable to the development of a health exhibit. This paper was read at the convention of the American Association of Dental Schools, Columbus, Ohio, March 21, 1932.

†Supervisor of the Bureau of Public Relations of the American Dental Association.

preciated the part that visual instruction was playing in our development. Once we were out in practice and face to face with actualities, we would have given much to possess the wealth of visual material to which we had access in our student days. Let us not be misunderstood in these statements: there was a tremendous amount of information given to us through lectures, textbooks and personal instruction, which furnished us with the necessary mental background to interpret properly what our eyes revealed.

Time has not materially changed our position since those memorable days when we received our graduation certificate and license to practice. If we are now the professional individuals that we should be, we are still students, we are still listening to lectures, reading textbooks and journals, still securing the benefits of visual instruction. Certainly, this is what organized dentistry, alumni associations and postgraduate courses of study mean to us today.

When we mention meetings in organized dentistry, those that naturally come to mind are the district, state, national and several of the larger component society meetings. Almost invariably, in practically all these, that phase of the meeting which receives the greatest attention, both from the committee in charge and from those in attendance, is the clinical program. The clinics are usually divided into table and chair clinics, and may be further divided into individual and group clinics; but, regardless of what we may call them, there is one point common to all: they depend on sight as the principal avenue through which their messages are conveyed to the minds of their audience. Of course, word of mouth and hand demonstration are important factors in the success of the clinic, but, after all, hand demonstration requires sight to make it of any value. Thus, in analyzing the clinic, which is our most popular form of teaching and means of learning, we would say that it depended primarily on sight for its educative value, supplementing its visual appeal with action and verbal explanation. We can all vouch for the success and drawing power of this type of instruction.

There are still two important factors which we have not mentioned. We have but to stroll through the clinics at any large meeting and what these are will immediately become apparent. Here and there, we will note that a clinician has not been able to attract attention. If we but observe for awhile we will discover what is responsible for this lack of interest. Either the clinician is showing something of little practical value, or his method of presentation does not attract attention nor retain the interest of an audience.

Why have we touched on these various points in connection with clinical demonstration? Only for the reason that all of what has been said applies to another closely related type of instruction: namely, the scientific exhibit. When we analyze the scientific exhibit in comparison with the clinic, we arrive at two conclusions: (1) an exhibit is in reality an enlarged clinic, except that (2) the exhibit is usually more nearly permanent in character.

At the present time, one noticeable difference between the scientific exhibit and the clinic lies in their popularity. There is no doubt that the clinic is much more popular than the scientific exhibit. Many society meetings have no scientific exhibits, while it is unusual not to have some form of clinical demonstration. Analysis of this condition suggests that this holds true because an exhibit requires more time, material and expense for its

development. Furthermore, exhibits are usually more bulky, and the difficulty and expense of transportation tend to discourage their use. Then, too, exhibitors complain that their efforts have not been appreciated by the profession and as a result they do not care to exhibit. Everything considered, we believe that this is indeed the outstanding cause of a lack of interest in the development of scientific exhibits. Regarded with the professional interest that clinics enjoy, the scientific exhibit will soon come into its own.

The conditions just mentioned appear to a large extent to be the cause of the lack of interest in the scientific exhibit, and they are, in fact, the explanation offered by the exhibitors. If we look at the situation from the standpoint of those who view the exhibits, we get an entirely different explanation and the reasons given from this point of view, when analyzed, prove that the features of a clinic which are responsible for its popularity appear to be almost entirely lacking in the development and presentation of many exhibits. Just why this is true, we cannot explain, but the individual who is asked to exhibit almost invariably makes the mistake of thinking that, in its development and presentation, an exhibit has no similarity to a clinic. Therein, we are convinced, lie the reasons for the lack of popularity of the scientific exhibit.

What are the factors in a clinic that are so frequently lacking in the scientific exhibit? To disregard the order of their importance, they are found in the following facts: 1. The subject matter is of professional interest. 2. The subject matter is practical. 3. All parts of the subject matter are closely related and contribute their portion to its complete understanding. 4. Nonessentials are carefully eliminated. 5. Good showmanship and capable personal demonstration are usually evident.

Let us look more carefully at these five points: 1. The subject matter is of professional interest. We all have our likes and dislikes, but there are some things that most of us enjoy, and because this is true in professional activity, we should, when considering the preparation of a scientific exhibit, be certain that our subject matter is of general interest. Those things that the trained scientist will enjoy are far too difficult for the rank and file of the profession to fully appreciate. But there must be some way in which the same material can be presented to interest the profession, if the exhibitor is willing to go to the trouble of working it out. To present an exhibit of highly scientific material at a convention largely attended by general practitioners will prove more or less of a disappointment and waste of time to the exhibitor. The proper place for such an exhibit is at a meeting of research workers and scientists.

2. The subject matter is practical. This is a very important item in the success of an exhibit. It is undoubtedly an important reason for the popularity of clinics. Most of the members of the profession who attend meetings do so with the expectation of learning something that will enable them to render better service to their patients and in as economical a manner as possible from the standpoint of energy, time and financial outlay. Unless an exhibit can offer something along those lines, it will not command attention.

3. All parts of the subject matter are closely related and contribute their portion to a complete understanding. How often have we viewed exhibits that were a hodgepodge of materials with which the exhibitor had apparently endeavored to fill up the space that had been given to him, without regard to relationship, se-

quence or conclusions that might be drawn! How much more effective it would be to decide what story was to be told and then select and arrange the material in such a way as to tell that story in as terse and understandable a manner as possible! And therein lies another one of the reasons for the success of the clinic: It endeavors to tell just one story. Its subject matter may bring out many points, but they are all related and tend only to the completion of the story the clinician set out to tell, it matters not whether it be the construction of an inlay or a denture or the extraction of an impacted third molar. An exhibitor should appreciate this fact, and should also understand that a person viewing his exhibit wishes to feel, when he has finished looking at it, that he has obtained something definite and concrete, and has not just wasted his time.

4. Nonessentials are carefully eliminated. In many respects, this item is closely related to the one just discussed, but it further enables us to bring out two important points: nonessentials (1) tend to divert attention from the main theme of the exhibit, and (2) are quite apt to give rise to unrelated questions which waste the energy and time of the exhibitor. These points are readily apparent without any further enlargement.

5. Good showmanship and capable personal demonstration are usually evident. By good showmanship, we mean that the exhibit is built or set up as attractively and neatly as possible. Nothing should be spared to arrest the eye of the passerby, because, after all, if attention cannot be directed to the exhibit, there might as well be no exhibit. Once we get the passerby to stop and look, the opportunity for telling our story is made possible. We should be quick to take advantage of this, but in the manner of the good salesman, we should not be too eager or we will drive our prospective audience away. A friendly smile, coupled with a question or statement directed at the subject of the exhibit and an offer to explain, will usually pave the way. Once we gain an audience and are able to hold the attention, we can feel quite confident of being kept busy. We cannot emphasize too much the importance of good showmanship and personal demonstration, and have but to observe the commercial exhibitor's methods to appreciate their value. There is an element of showmanship and competition there that can be applied just as effectively in the presentation of the scientific exhibit. Each exhibitor is competing with every other exhibitor for attention. To depend entirely on labels to do the work is sure to prove disappointing to the exhibitor and to the person viewing the exhibit. We have all seen exhibits in museums which, while they were quite thoroughly labeled, seemed entirely different to us when explained by a guide or attendant. To view an exhibit without receiving an explanation of it is much like driving through a strange city and depending on the street signs for information concerning points of interest.

Replies to questionnaires sent out from this office indicate that one reason for the lack of interest in presenting scientific exhibits is a paucity of material. Certainly, this is to be regretted. Several years of experience in superintending health and scientific exhibits gives assurance that there is a great future for these exhibits. Already grumblings are heard to the effect that the clinical type of convention instruction is not entirely satisfactory, the principal reason given being that, in the short space of a morning or an afternoon, when many interesting clinics are in progress, it is impossible to get the most good from the clinical demonstration. There

are the factors of crowding, noise, haste and the desire to see several clinics at the same time, all tending to rob those in attendance of the benefits that they had hoped to secure. It would not be a long step to expand the best of these clinics into scientific exhibits and thereby make them available throughout the entire period of the convention. Those interested could then leisurely and comfortably view the presentation of their favorite subjects, returning again after due reflection, if necessary, to clear up some perplexing question. Such an innovation would, it is believed, meet with instantaneous and whole-hearted acceptance by the profession.

Those who have nothing available for exhibit purposes are urged to make an effort to develop material. As stated before, bulk is not of importance, but that the material be pertinent and practical is. It is no disgrace to have a 10-foot exhibit space when others have twice as much. Quality, not quantity, counts. Furthermore, there is perhaps no better way to make an inventory of one's scientific labors than to build an exhibit of them. Thus, the trend of our work becomes evident, and we are enabled to see wherein our efforts are falling short. And, if the result of our labors is of practical value to our profession, there is no better vehicle for presenting it than through the scientific exhibit. To see is to believe, especially among the rank and file.

A. D. A. Broadcast Changed

Owing to the cancellation of the Columbia "Farm Hour" program, the American Dental Association chain broadcasts have been discontinued. In place of that period, we have been granted a five-minute period each Friday over the Chicago station WBBM. This is not a chain hookup, but station WBBM is readily picked up in many sections of the country. The period of the broadcast is from 1:30 to 1:35 p. m., central daylight saving time (12:30 to 12:35 p. m. central standard time).

We again urge our members to call the attention of their patients to these weekly broadcasts. We would also like to have the members tune in on the broadcasts whenever possible and let us have their comments and constructive criticism.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Prophylaxis of Postoperative Pneumonia by Oral Hygiene: In a preliminary report, S. W. A. Franken (*Arch. Int. Med.*, December, 1931) outlines the technic employed in reducing mouth sepsis in an effort to prevent the development of postoperative pneumonia in the hospital with which he is connected as dental intern. He lists the suggestions made in the literature of the last two decades regarding measures to reduce this postoperative condition, as follows: 1. The better protection of the patient from chills and drafts before, during and after operation and in his journey to and from the operating room. 2. The use for abdominal operation of bandages of a type that will aid in relieving the pain of breathing and permit deeper inhalation. 3. The use of opiates for a few days after operation to facilitate breathing by elimination of pain. 4. The inhalation of carbon dioxid and oxygen at the termination of general anesthesia, for ventilating and removing the anesthetic from the lungs to restore normal breathing. 5. The postponement of operations in the presence of active or recent disturbances of the upper respiratory tract. 6. The choice of anesthesia and its administration by a trained personnel. Other factors in the causation of postoperative pneumonia are listed as (1) the site of operation; (2) the presence of latent pulmonary disease, and (3) the aspiration of septic material from the mouth, the last named probably being the commonest cause of the condition. In an effort to reduce the sepsis of the mouths in surgical cases, and with the cooperation of the Lenox Hill Hospital staff, the author established the following oral hygiene technic: Adhering to the general fact that patients with nonemergency cases are admitted to the hospital for observation from two to four days prior to operation, the dental department contrives to do its work during that period. This can be, and is, done without interfering with the patients' usual preoperative surgical routine of examinations, laboratory tests and observation. As soon as possible after admission to the wards, the patient is sent to the dental room, which is situated near the surgical wards. First, the gums and teeth are thoroughly swabbed by the dental hygienist with a solution consisting of zinc chlorid, 15 parts, distilled water, 10 parts, iodin crystals, 25 parts and glycerin, 50 parts. After the swabbing, the teeth are thoroughly scaled and polished, and the condition of the mouth is charted, on a separate dental sheet of a distinguishing color, as to carious teeth, teeth to be extracted, missing teeth, condition of the soft parts and the presence of crowns and bridges. The patient is also instructed in the proper use of a toothbrush, and, if without, he is presented with a good, serviceable one. This toothbrush is not the usual clinic type, with bamboo handle, but has a good bone handle with seven pairs of double row bristles. The patient then returns to the ward, where the medical nurse sees that he uses hourly a mouth wash consisting of a 2 per cent formaldehyd solution—a teaspoonful to one-half glass of water. In the event of infected roots or teeth, the dental intern immediately begins to extract one at a time, at intervals of twenty-four hours, and then only if there has been no unfavorable reaction after the first or subsequent extractions. If any reaction, such as a rise of temperature, should occur after extraction, the intern is not permitted to continue until not only the subsidence of symptoms takes place, but also a consultation is held with the surgical staff as to the advisability of further extractions. Extractions are never done in the twenty-four hours immediately preceding the scheduled surgical operation. On the second morning after admission, the patient's mouth is again swabbed with the solution used immediately after admission, and the formaldehyd mouth wash is used every hour. This daily swabbing and hourly mouth wash are continued up to the time the patient leaves the ward to go to the anesthesia room, where he gets the final swab and mouth wash. The number of cases which the author

hoped to report on was reduced by the large percentage of patients who did not go to operation as well as by the number of those who were transferred to other services. Emergency operations were also excluded from the report, but it is hoped to work out a rapid technic that may be used in such cases. The results in the 859 cases reported on were very encouraging, only 0.81 per cent of the patients developing postoperative pneumonia, as against an incidence of 2.5 per cent in the untreated cases. During this period, there was a rise of approximately 16 per cent in postoperative pneumonia cases in New York City. The routine for reducing oral sepsis can be established in any general hospital with comparatively small expenditure, but requires constant cooperation and surveillance.

Surgical Correction of Cleft Lip and Palate: The great number of operative failures in the surgical treatment of congenital cleft lip and palate, estimated at from 70 to 80 per cent, should, it is believed by Albert D. Davis (*Surg., Gynec. & Obst.*, April, 1931), arrest the attention of all surgeons. The preponderence of failures has led many surgeons to abandon palatoplastic surgery, although many persons, perhaps less well prepared by training and experience to handle these cases, are devoting a part of their time to correction of these deformities. A review of the literature from different parts of the world seems to indicate that there is probably no other field of surgery in which such a variance of opinion exists as to the technic of choice. In the United States, operators are divided into those employing the Brophy technic and those opposed to it. The author believes that the fundamental value of the Brophy bone operation cannot be overestimated, and he makes a plea for a better understanding of the anatomy and functional activity of the palate. Failure of union is seen to result in abnormality of the bony arch, abnormal occlusion of the teeth, a shortness and tenseness of the soft palate, with imperfect speech ensuing, an imperfect foundation for lip or soft palate operation and for orthodontic treatment, with probable increase in the cleft if movement is attempted. The importance of the time of operation and sequence of operations cannot be too greatly stressed. The spreading of the tuberosities when single wire sutures are placed causes (1) difficult approximation of the soft tissues, oftentimes necessitating the use of lateral incisions, which are condemned, and (2) malocclusion of the teeth, operation being required also to lengthen the palate in order to ensure perfect speech, the goal of the soft tissue operation. Mere closure of the defect without anatomic and functional result is a poor substitute. The author believes that the more common employment of a pediatrician has accounted for a decrease in mortality.

Operative Treatment of Losses of Substance of Mandible: The operative treatment of losses of substance of the mandible is discussed by Ivy and Curtis (*Surg., Gynec. & Obst.*, April, 1931) with special reference to fixation of edentulous fragments, covering the preliminary reduction and fixation of the fragments in normal position, the steps in construction, the filling of the mandibular defect by a bone graft and the postoperative treatment. As illustrative of the application of the principles of their treatment, they quote the following case: H. H., a man, aged 32, was shot with a large caliber pistol in August, 1929, the bullet entering the left side of the face, shattering the left side of the mandible and remaining embedded in the tissues. An operation was performed at that time for removal of detached teeth, bone fragments and the bullet. In October, an openbite metal dental splint, with saddle resting on the gum over the posterior edentulous fragment, was inserted. By January, 1930, suppuration had ceased and the tissues had healed. The patient was referred to the authors for further treatment, March 27, 1930. At this time, a gap of about 1½ inches was found on the left side of the mandible. This defect extended from just posterior to the left central incisor tooth to about the second molar region. There were no teeth in the bone fragment posterior to the defect. Only four teeth were present in the main mandibular fragment. The metal splint was still in position and the saddle resting on the gum kept the short posterior fragment down in place, but there was ulceration of the soft tissues from undue pressure. On removal of the splint, the main mandibular fragment was found to be freely movable and showed a tendency to swing over to the left side, throwing the teeth out of occlusion and causing marked external deformity. The metal splint was discarded and the remaining teeth were brought into correct occlusion with the upper teeth and fastened by means of wire arches. The short posterior fragment was prevented from tilting upward by wire passed through the left angle and connected to a

plaster-of-Paris head cap. May 16, the gap in the mandible was filled by a bone graft from the crest of the ilium. June 20, the head cap and traction wire were removed. September 8, the wires connecting the teeth were cut and bone consolidation was practically complete. The patient could open the mouth without any lateral deviation of the mandible.

Present Status of the Anesthesia Problem: Report is made by Arthur Dean Bevan, (J. A. *M. A.*, Nov. 21, 1931) of a clinical research which has been carried on in the surgical clinic at Rush Medical College for more than thirty years and which was undertaken for the purpose of determining the safest, simplest and most efficient anesthetics for use in general surgical work. In evaluating the anesthetic, the following were considered: 1. Safety of the patient. 2. Comfort of the patient. 3. The efficiency of the anesthetic agent. 4. Control, avoiding anesthetics which cannot be withdrawn at the first sign of danger. 5. The elimination of psychic trauma through the abolishing of both pain and consciousness. 6. The simplicity and general adaptability of the method. 7. The absence of injurious effects on the organs, tissues and blood. 8. The absence of complications, such as vomiting, headache and delirium. 9. The absence of effects that lower the resistance to organisms such as pneumococci and streptococci. The author considers under volatile anesthetics chloroform by inhalation, open drop method, ether by inhalation, open drop method, nitrous oxid gas and oxygen, and ethylene-oxygen anesthesia, and under preanesthetic medication and basic anesthetics, scopolamin and morphin, and avertin, or tribrom-ethyl alcohol. He further considers cocain and its substitutes, in local infiltration anesthesia, blocking, spinal anesthesia and, under special methods of using ether, intrapharyngeal, intratracheal and intrarectal ether anesthesia, and intravenous anesthesia. The author concludes: "One should never attempt to cover a wider field with an anesthetic than it can properly and easily cover. The patient's psychology as well as his safety should be considered. The anesthetic should be employed so that the patient has no pain and no psychic trauma. . . . Anesthesia must be placed in the hands of trained experts. The trained expert anesthetist is an absolute necessity in a well organized surgical clinic. Woman physicians make excellent anesthetists; they are, I think, as a rule, better than men and better than trained nurses. Woman doctors, I have found, are especially fitted for this work, and it offers medical women a very interesting and profitable field. The trained anesthetist in America is now more generally recognized as an essential member of a well organized operating team than anywhere else in the world. This is one of the reasons that so much better work is being done in America in anesthesia than is being done in other countries. Anesthesia is such an important part of surgery that it must always remain in the control of the surgeon. The surgeon is responsible for the entire operation, including the anesthetic. He must decide on the anesthetic and see that it is properly given. This means that the use of chloroform, of intraspinal anesthesia, of intravenous anesthesia, of intrarectal anesthesia, of intratracheal anesthesia and of the so-called basic anesthetics, such as scopolamin, avertin and amytal, must be limited to very narrow fields. Fortunately, local anesthesia, gas anesthesia and ether afford three anesthetic measures which, if handled by an expert, can be used alone or in sequence, with abolition of pain and, if desired, the abolition of consciousness and, when required, complete relaxation, and can secure complete and safe anesthesia for any and all surgical operations. This places anesthesia on a very unpretentious, simple basis, but here, as in all fields of surgery, it finally becomes apparent that simplicity is near truth. The general adoption of this simple scheme of anesthesia will prevent many anesthetic accidents and save many lives."

Breaking of Hypodermic Needles: The breaking of hypodermic needles during injection, leaving the broken fragment in the tissues of the patient, continues to furnish one of our great medical defense societies, the London and Counties Medical Protection Association, with a difficult problem. The physician or the dentist who administers the injection incurs a legal liability for negligence to the patient, who can allege want to skill. If the physician pleads that he used the needle correctly but that there was some flaw in its manufacture, he is liable for using such a needle, though for this the manufacturer has a liability to him. But the trouble is that it is impossible to say why certain needles break and whether this is due to any flaw in their manufacture. It has been suggested that they may be injured by antiseptic solutions. As shown in a previous letter, the Condon and

Counties Medical Protection Society thoroughly investigated the subject and consulted expert metallurgists. They issued in their annual report a number of recommendations: 1. A new needle should be used in every case. 2. Needles should never be "flamed," as this may injure the temper. 3. As the needle always breaks at the point of entry into the holder, a short holder should be used, so that if fracture occurs a large portion will remain in the tissues, and thus be more easily removed. 4. Needles should not be kept in watery solutions. 5. Better results are obtained from needles made of alloy steels (such as stainless steel), which do not require subsequent heat treatment and are generally more flexible than those made of carbon steel. But, though these recommendations were issued two years ago, the breakages continue to occur. . . . Though roentgenography has been employed, it has generally proved impossible to remove the fragment by operation. So far, no case has been taken into court, but in some cases damages have been paid to settle the matter.—London letter, *J. A. M. A.*, Nov. 21, 1931.

Surgery and Safety: It must never be forgotten that it is the patient who pays the price of the surgeon's mistakes. From that law there is no repeal. Indeed, it might be well for us to remind ourselves constantly of a thing that we are in much danger of forgetting in these overly scientific days, that the center of the surgical universe, if I may so express it, is the patient himself. He is the person chiefly concerned in every operative act. He submits to surgery for one of two reasons, to save his life or to improve his health. He and not the surgeon is the ultimate judge of the success or failure of every operation. To him, surgery is always an evil and he wants to be certain of the necessity for it, not in an abstract case but in his own personal case. He is not grateful for the performance of a perfect technical operation if it does not happen to be indicated for the relief of his particular disease. It is quite possible, from his standpoint, to have as the end-result of surgery a perfectly healed wound and a permanently impaired function.—C. Jeff Miller, in *Am. J. Surg.*, August, 1931.

Hexylresorcinol in Vincent's Angina: Thirty-five patients with Vincent's angina, some of whom had severe cases, were treated by means of hourly swabbing or gargling, according to their condition, with a dilution of 1 ounce of hexylresorcinol to 1 pint of water, alternating with a solution of sodium perborate. (Harry Butler, in *Arch. Otolaryn.*) Negative smears were obtained in one week, and complete recovery in two weeks after the institution of this treatment. One-half of the patients received local treatment with arsphenamin and glycerin, whereas the other half did not. There was no difference in the response of the two groups.—Abstr. *Am. J. Dis. Child.*

Conditions that Interfere with Dentition: Nutritional disturbances due to deficiencies in the modern diets are largely responsible for defects in the teeth of children. Other factors are the acidity of the saliva, insufficient mastication and the lack of vitamins A, B and C, resulting in the faulty metabolism of mineral salts, principally calcium. The latter occurs in the tissues as follows: enamel, 82.14 per cent; dentin, 70.8 per cent; bone, 36.14 per cent; cartilage, 4.1 per cent, and blood, 0.12 per cent. The thyroid and parathyroid glands are important in the metabolism of calcium. Ablation of the parathyroid results in hypoplasia of the enamel and defective calcification of the dentin. (Francisco Badia Y Miro, in *Med. de los niños;* abstr. *Am. J. Dis. Child.*)

Acute Rheumatic Polyarthritis and Focal Infection: This article is based on 204 cases of typical acute rheumatic polyarthritis which were followed up after from five to eighteen years. In 113, there were chronic or repeated attacks of angina, in nine there was infection of the teeth and in ten others polyarthritis followed acute infection. In seventy cases, no other illness preceded the attack. In seventy-four, rheumatic heart disease was definitely established. In those without heart involvement, recurrences were observed in 8 per cent. In those with heart involvement in the first attack, recurrences were observed in 27 per cent. Operations for focal infections appear to make no difference in the number of recurrences. The author feels that constitutional and allergic factors are more important than infection. (G. van Conta, in *Klin. Wchnschr.;* abstr. *Am. J. Dis. Child.*)

MISCELLANY

BOOK REVIEWS

Foods in Health and Disease. By Lulu G. Graves, Consultant in Nutrition and Diet Therapy; Formerly Professor of Home Economics, Cornell University; Formerly Associate Professor of Home Economics, Iowa State College; Formerly Chief Dietitian at Michael Reese Hospital, Chicago; Lakeside Hospital, Cleveland, and Mt. Sinai Hospital, New York; Honorary President, American Dietetic Association. 390 pages. Price, $3.50. Published by the Macmillan Company, New York City.

There can be no question of the growing interest in the subject of nutrition and diet, and this book is apparently an effort to simplify the question of food so that the practical housewife may be able to apply the knowledge to her everyday needs. There are two general divisions of the subject: "Foods in Health," and "Foods in Disease," and each division is significant of the functions for which it was intended. The treatment of the subject makes it attractive, whether to the profession or to the laity, and a careful study of the contents will repay the effort. The illustrative matter is good and the mechanical makeup of the volume is excellent.

Conquering Arthritis. By H. M. Margolis, M.D. 192 pages. Price, $2.00. Published by the Macmillan Company, New York City.

In view of the fact that, in recent times, much in professional literature has aimed to connect pulpless teeth with the causation of arthritis, the present volume will hold the interest of the dentist. The author is broad-minded enough to recognize the fact that there is something yet to be learned about this disease and that no one treatment is universally effective. He says: "Because of the stubbornness of the disease it is often rebellious to treatment, and the results of treatment are therefore not uniformly favorable. Moreover, the causes of some forms of arthritis are not yet definitely known. This realization has brought to the patient a certain sense of frustration." This volume will contribute much to the knowledge of the subject of treating arthritis.

A Child's Book of the Teeth. By Harrison Wader Ferguson, D.D.S. Illustrated by the author. Revised and enlarged edition. 106 pages. Price, 68 cents. Published by the World Book Company, New York City.

This is a very attractive little volume intended for the most part for children, and made interesting through the medium of a unique illustrative program, which will engage the attention of all of those who look into it. Nothing quite like this book is to be found in dental literature, and it deserves a wide circulation.

Lives. By Gustav Eckstein. 216 pages. Price, $2.50. Published by Harper & Brothers, New York City and London.

This book deals in a characteristic way with the lives and experiences of all sorts of things; for instance, rats, cockroaches, parrots, cats, canaries, macaws, turtles, pigeons and men. One of the chief characters is a Portuguese who has come to America and introduced his own peculiar customs into his adopted country, with results that are unique and surprising. Evidently, the author has a keen insight into the habits and characteristics of the individuals that he is portraying, whether animals or men, and there is a vivid touch in many of the situations, and much of interest in the various experiences.

Books Received

The Practice of Absorption Spectrophotometry with Hilger Instruments. A Guide to the Technique of Absorption Measurement in the Visible, Ultraviolet and Infrared Regions of the Spectrum. By F. Twyman, F.Inst.P., F.R.S., with the collaboration of the staff and advisers of Adam Hilger, Ltd. 80 pages. Price, 5 shillings. Published by Adam Hilger, Ltd., London.

Recent Applications of Absorption Spectrophotometry. A bibliography selected and compiled by the advisers and staff of Adam Hilger, Ltd. 44 pages. Price, 3 shillings, 6 pence. Published by Adam Hilger, Ltd., London.

SOCIAL INSURANCE: DETERIORATION OF MEDICAL SERVICES UNDER COMPULSORY HEALTH INSURANCE

By EDWARD H. OCHSNER, M.D., Chicago, Ill.

About fifteen years ago, when the prices of eggs and chicken feed were at their highest, I wrote my farm tenant and asked him why he was not sending us any eggs. I received the following laconic answer: "The pullets look good but lay no eggs." Superficially examined, compulsory health insurance "looks good," but, unlike my pullets, it has laid many eggs, most of which are addled.

When we substitute governmental control in medicine and dentistry for independent individual action, we stifle self-expression, individuality, initiative, courage, confidence, enthusisam and industry. We, as a nation, are on the whole already overstandardized. The very ones who wail the loudest about the evils of mechanization are often the very ones who clamor the most for more government control. Excessive bureaucratic and lay control have much the same spiritual effect on the professional man as overmechanization has on the intelligent craftsman. They both have a tendency to crush out fortitude, ingenuity and pride of achievement in those engaged in these vocations. With some, standardization has become almost a fetish, in spite of the fact that, when pushed too far, it always results in mediocrity. The efficient, successful practice of medicine always has been and always will be a personal unstandardized affair.

That the quality of medical services has deteriorated in those countries which have compulsory health insurance is due to many conditions, among which may be mentioned the excessive number of calls on the time and energy of the physician. Those who receive free medical service are constantly consulting the physician for every trifling ailment or compelling the physician to make many unnecessary calls at the homes. Every *Krankenkasse* physician who has been interviewed has stressed this fact. Baeumer states, in his book, that between 65 and 70 per cent of all calls are unnecessary, consume the time and energy of the physician and the resources of the *Krankenkasse* and prevent the giving of adequate medical service and hospital care to the really sick. Liek, in his book, says that the number of trivial conditions, for which treatment was demanded, such as "microscopic skin abrasions, etc.," disgusted him so much that he retired from the service. This abuse has grown to such proportions in Germany that the government department has been compelled to issue new regulations to the effect that the insured have to pay a certain fee out of their own pockets for each prescription. This again has given rise to new abuses. A common sequence of new regulations to correct one abuse is an opportunity for newer ones. In England, unnecessary night calls became so common that many panel physicians disconnected their phones between 10 p.m. and 7 a.m. A fine state of affairs if a patient has a strangulated hernia, an attack of gallstones or acute appendicitis at midnight! We have all repeatedly seen and heard the statement that the workers of this country do not have medical service when they most need it; namely, at the beginning of an illness. The claim is made that were prompt services available at this time, much serious illness could be avoided. Conclusive proof that private practice is more prompt than compulsory health insurance practice in giving service is evidenced by the practice in England of avoiding night calls, and by the fact that the percentage of pus appendix cases which necessitate draining is much greater in Germany than in the United States. We all know how the mortality rate is increased by letting acute appendicitis cases progress to suppuration before the patient is operated on and how much longer the period of hospitalization is in suppurative cases. If acute illnesses had more prompt and more efficient treatment in Germany, for instance, than in the United States, suppurative appendix cases should be much less frequent, the mortality rate lower and the morbidity shortened. As a matter of fact, the reverse is the case, which proves rather conclusively that medical service in the United States is more efficient than that in Germany. Such abuses result in endless rules and regulations. Rules that accomplish little except to cramp the individuality and personality of the conscientious physician, wear him out with paper work and leave little time and energy for professional study and advancement. One official described his plight in the following words: "I've settled into official routine; I'm fixed there hard and fast. It's so with many of us. Most of us recognize the hopelessness of ever pulling out. As I sometimes confess, I am merely one of the unburied dead."

That compulsory health insurance does not in fact prevent sickness nor reduce economic

loss as the result of sickness is also proved by the following facts. Before the World War, the average loss of time for sickness of the American laboring man was six and two-tenths days a year; the German's, nine and two-tenths; the Austrian's, nine and five-tenths. We are credibly informed that, since 1923, the loss of time in Germany has increased another 80 per cent above the nine and two-tenths so that it now stands at approximately sixteen and five-tenths (16.5) as against six and two-tenths (6.2) in America. A fine showing for compulsory health insurance after forty-eight years of operation!

Let us see what some of the German and English think about the scheme. A high salaried German health insurance official said in 1927: "Health insurance is the oldest branch of German social insurance. The sickness insurance law of June 15, 1883, was the cornerstone of the proud building for which we were envied by foreign nations before the war. Unemployment insurance will, I hope in the near future, be the capstone of the building." To which Edwin Liek, a practicing physician of Danzig, makes the following retort: "This is an expression familiar to physicians, words that we have frequently heard during the past four decades. Only now they affect us differently. In the beginning the doctors believed these dulcet tones; today only *parasitic physicians* or *pure fools* join in this festive song." And again he says, "Social insurance is today organized to fill the feed trough of *bureaucratic drones*." At a recent meeting of the Trade Union Council in Nottingham, England, a resolution was passed unanimously demanding that the Government overhaul the Department of National Health.

That the average American citizen is getting better medical service than are the citizens of those countries which have had compulsory health insurance the longest is borne out by the cited statistics, the quoted opinions as well as by a rather extensive personal experience both in this country and in Central Europe.

(The next two articles will show how social insurance undermines national character.)

THE SOCIAL SIGNIFICANCE OF PROFESSIONAL ETHICS

By IRWIN G. JIRKA, D.D.S., Chicago, Ill.

The whole argument with regard to the validity of and the extensibility of the professional motive is remarkably demonstrated by R. H. Tawney of Oxford in his admirable, "Acquisitive Society." He says, in part: "A profession may be defined most simply as a trade which is organized, incompletely, no doubt, but genuinely for the performance of function.

"It is not simply a collection of individuals who get a living for themselves by the same kind of work, nor is it merely a group which is organized exclusively for the economic protection of its members, though this is normally among its purposes.

"It is a body of men who carry on their work in accordance with rules designed to enforce certain standards both for the better protection of its members and for the better service to the public.

"The standards which it maintains may be high or low. All professions have some rules which protect the interests of the community and others which are an imposition on it. Its essence is that it assumes certain responsibilities for the competence of its members on the quality of its wares.

"If any of these ideas are to be brought into effect in the interrelations of society, if the professional ideal is to be to any extent carried over into other fields, it behooves the professional man to perfect his ideals. It would be absurd to ignore the fact that these ideals are far from perfection, that professional standards are uncertain and purposes vague."

Dental societies have gone through and are still going through various stages of liberation from selfishness. The first stage of organization was to protect the members against unfair competition and to improve the profession in public consideration.

Then followed the stage in which the relationships between members of the same profession were considered as most important; certain courtesies were to be extended from one member of the profession to another. Then, they were bound together to prevent outsiders from interfering or to protect the profession against unjust laws.

Next followed the movement to improve admission to practice. Educational qualifications were established and the schools were looked after. Finally, there was attained the stage in which permanent importance is given to the relationship of the profession to the service which it may be expected to render; that is to say, the stage where public needs are placed paramount to professional rights or codes. The various professions incidentally

are today, in different degrees, within one or more of these several stages of development.

This last and manifestly most socially valuable stage of development of professional organization can best be advanced if the members of the several professions and the professions also come together and test the validity of their several standards in the light of the criticism of members in one profession and of those who practice some other profession.

The weakness of professional influence in public life comes about through the fact that each profession in the past when endeavoring to affect public affairs had spoken for itself alone and hence its opinions were always suspected of being influenced by self-interest. Nothing is more important than that those best qualified to speak on any particular topic shall be able to bring their opinions to bear on public conduct and affairs. Nothing is more evident today than that the inexpert is listened to more frequently, perhaps more trustfully, than the expert on public policy. Something more is evidently needed than a common technic and a common occupation in order that an ethical code shall result.

In the ideal of service, let us try to understand the comparison Rousseau drew between the "will of all" and the "general will." Let us analyze briefly, on the one hand, the professional interest and, on the other, the relation of that interest to the general welfare.

Ethics cannot be summed up in a series of inviolate rules or commandments which can be applied everywhere and always without regard to circumstances, thought of consequences or comprehension of the ends to be obtained. What is universal is the good in view, and ethical rules are but generally approved ways of preserving it. The rules may clash with one another and then the only way out is to look for guidance to the ideal. Every profession has its own problems of conduct in the interpretation within its own province of the common principles of ethical conduct. The medical man to whom is entrusted, under conditions which usually admit of no appeal save to his own conscience, the safeguarding of the health of his patient, with due consideration for the health of the whole community, has to depend on a special code applicable to that situation. So with the legal profession, which, for example, has to provide professional service for all litigants irrespective of the popularity or unpopularity of the cause. So with the university professor, who has to uphold the necessity of academic freedom against the pressure of prejudice and the domination of controlling interests. So with the engineer, the architect, the surveyor, the technician, the manager, the secretary or the officer of a corporation. Out of such situations, develop the written and the unwritten codes of professional ethics.

An ethical code is something more than the prescription of the duty of an individual toward others. In that very act, it prescribes their duty toward him and makes his welfare its aim, refuting the false dissociation of the individual and the social. But the general ethical code prescribes simply the duties of the members toward one another. What gives the professional code its peculiar significance is that it prescribes also the duties of a whole group toward those outside the group. It is just here that, in the past, ethical theory and practice alike have shown the greatest weakness. The group code has narrowed the sense of responsibility by refusing to admit the application of its sanction, most notably in the case of national groups, which have refused to apply or even relate their internal codes to the international world.

If professional groups will attempt to coordinate their responsibilities, relating at once the individual to the group, and the group itself to the wider community, they will mark an important advance.

The day is at hand when we must recognize our basic professional responsibilities and carry over into other fields of human activity a service to the entire public need irrespective of class; perfect and advance our standards; justify our ideals with the public interests, and lay the foundation of a broader, more democratic inclusiveness, based on the prime importance of the functional relationships between individuals, groups, states and nations.

NEWS

Denver Dental School Closes: The School of Dentistry, University of Denver, closed its doors after the twelve 1932 graduates had received their diplomas. The school had been in operation for forty-four years and was led to end its educational activities because of the ruling that no more dental colleges would be given a class A rating unless they were affiliated with medical schools. P. W. Bamford, dean for the last three years, estimates that at least 900 dentists have been graduated by the school. Before the college was taken over by Denver University, in 1922, it was

known as the Colorado College of Dental Surgery.

Dentist Lost in Far North: Karl Kuehnert, Crystal Lake, Ill., graduate of the Northwestern University Dental School in 1931, and dentist of the Grenfell Mission on the Labrador, has been missing since May 30, when he took off on a short pleasure trip as a passenger in a Gypsy Moth plane from St. Anthony, near St. John's, N. F., where he was connected with the St. Anthony Hospital. Search for Dr. Kuehnert and the pilot of the plane, continued by land and sea for ten days, has been abandoned.

New Library at Medical College of Virginia: The Carnegie Corporation, New York City, has made an appropriation of $10,000 toward the maintenance of the library of the Medical College of Virginia, which will this summer be housed in a handsome new building. Adjoining the new library of the college, the Richmond Academy of Medicine has built its home and library. This will contain the famous Joseph L. Miller collection of rare first editions, engravings, silhouettes, medical curios, etc. The headquarters of the Medical Society of Virginia will also be located in the Academy of Medicine building.

American Dental Society of the Argentine Republic: A new society has been organized in Argentina consisting of ethical American graduates practicing in that country. At present, there are twenty active members with a prospect of ten more. The object is mutual improvement and the elevation of the profession through the medium of postgraduate study. The corresponding secretary is M. V. Tidball, Santa Fe 911, Buenos Aires, Argentina, S. A.

Deaths

Brady, David C., Chicago, Ill.; died recently from injuries suffered May 22, near East Troy, Wis., when his automobile overturned; aged 26.

Yeatman, O. B., Evanston, Ill.; University of Illinois, College of Dentistry, 1920; died recently, after operation for removal of a chicken bone which had lodged in his throat, with infection and pneumonia ensuing; aged 37.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Buffalo, N.Y., September 12-16.

American Academy of Periodontology, Buffalo, N. Y., September 8-10.

American Full Denture Society, Buffalo, N. Y., September 9-10.

American Society for the Advancement of General Anesthesia in Dentistry, New York City, October 24.

American Society of Oral Surgeons and Exodontists, Buffalo, N. Y., September 9-10.

Association of American Women Dentists, Buffalo, N. Y., September 12.

British, Canadian and Ontario Dental Associations, Toronto, August 8-12.

Fédération Dentaire Internationale, Zurich, Switzerland, August 2-9.

Greater New York December Meeting, New York City, December 5-9.

Interstate Dental Association, Bordentown, N. J., July 11-13.

Italian Stomatologic Congress, Rome, September.

Montreal Dental Club, October 13-15.

National Association of Dental Examiners, Buffalo, N. Y., September 10.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Southern Society of Orthodontists, Knoxville, Tenn., October 31-November 2.

American Dental Assistants Association, Buffalo, N. Y., September 12-15.

American Dental Hygienists' Association, Buffalo, N. Y., September 12-16.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

July

New Jersey, at Bordentown (11-13).

Washington, at Seattle (5-9).

November

Florida, at Hollywood (3-5).

December

Ohio, at Cleveland (5-7).

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of The Journal.

STATE BOARD OF DENTAL EXAMINERS

Arizona, at Flagstaff, July 25. Norton J. Wood, Secretary, Grunow Clinic, Phoenix.

Montana, at Helena, July 11-15. T. P. Regan, Secretary, Helena.

New Jersey, at Trenton, June 27-July 2. John C. Forsyth, Secretary, 148 W. State St., Trenton.

OHIO STATE DENTAL SOCIETY

The Ohio State Dental Society will hold its 1932 meeting in Cleveland, December 5-7. It is intended to make this the most extensive meeting that the society has ever held, covering all branches of dental practice, with essayists and clinicians drawn from all over the country.

JOHN T. REIFKE
Outside Publicity Committee
9205 Miles Ave.
Cleveland

AMERICAN DENTAL SOCIETY OF EUROPE

(Meeting Cancelled)

In view of the social unrest and the general economic condition, the annual meeting of the American Dental Society of Europe that was to have been held in Baden-Baden, August 9-11, has been cancelled.

DAWSON BUCKLEY, *Secretary*
25 Blvd. Victor Hugo
Nice, France

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The first scientific program of the American Society for the Advancement of General Anesthesia in Dentistry for the season 1932-1933 will be presented October 24 at the New York Physicians Club, 133 E. 58th St., New York City, with a dinner at 7 and the scientific session at 8:15 p. m. Membership in this organization is available to members of the American Dental Association, American Medical Association, registered nurses and scientists interested in the field of anesthesia.

LEONARD S. MORVAY, *Sec'y-Treas.*
76 Clinton Ave.
Newark, N. J.

MONTREAL DENTAL CLUB

The eighth annual fall clinic of the Montreal Dental Club will be held October 13-15, at the Windsor Hotel, with a program of essays covering focal infection, prosthodontia, cast abutments and the use of the toothbrush in periodontal disease. Table clinics will also be given. Fee, including luncheon, October 13-14, $17.

ERWIN C. BURBANK, *Publicity Chairman*
1008 Medical Arts Bldg.
Montreal

BRITISH, CANADIAN AND ONTARIO DENTAL ASSOCIATIONS

The attention of the dentists of the United States is directed to the Joint Convention of the British, Canadian and Ontario Dental Associations to be held at the Royal York Hotel, Toronto, August 8-12. This will be the largest dental meeting ever held in Canada and our confrères in the United States are cordially invited as guests. The golf committee is arranging an International dental golf tournament so bring your clubs with you.

FRED J. CONBOY, Publicity Committee
East Block, Parliament Bldgs.
Toronto

ASSOCIATION OF AMERICAN WOMEN DENTISTS

The eleventh annual meeting of the Association of American Women Dentists will be held at the Statler Hotel, Buffalo, N. Y., September 12, at 2 p. m., with a banquet at 6:30 p. m.

GENEVA E. GROTH, *Chairman*
Publicity Committee,
1301 Medical Arts Bldg.,
Philadelphia, Pa.

CONJOINT BANQUET OF THE ASSOCIATION OF MILITARY DENTAL SURGEONS AND THE PREPAREDNESS LEAGUE OF AMERICAN DENTISTS

The Association of Military Dental Surgeons and the Preparedness League of American Dentists will hold a conjoint banquet, September 14, at 7 p. m. All members and officers are cordially invited to attend. Joint headquarters will be at the Hotel Statler. Write for reservations for banquet to the Conjoint Banquet Committee, 1839 Hotel Statler, Buffalo, N. Y.

RAILROAD RATES TO BUFFALO, N. Y.

The American Dental Association has discontinued the use of the Identification Convention Certificate, and again this year is using the "Certificate Plan." The certificates will be obtainable from your railroad agent, and NOT THROUGH THIS OFFICE. Following is full information regarding the plan.

The following directions are submitted for your guidance:

1. Be sure that when purchasing going ticket you request a CERTIFICATE. *Do not make the mistake of asking for a "Receipt."*

2. Present yourself at the railroad station for tickets and Certificates at least 30 minutes before departure of train on which you will begin your journey.

3. *Certificates are not kept at all stations.* If you inquire at your home station, you can ascertain whether Certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at what station they can be obtained. You can in such case purchase a local ticket to the station which has Certificates in stock, where you can purchase a through ticket and at the same time ask for and obtain a Certificate to place of meeting.

4. *Immediately on your arrival at the meeting present your Certificate* to the endorsing officer, Dr. John J. Ogden, Vice-President, as the reduced fares for the return journey will not apply unless you are properly identified as provided for by the Certificates.

5. *It has been arranged that the Special Agent of the Carriers will be in attendance on September 13 to 15 from 8:30 a. m. to 5:30 p. m., to validate Certificates.* If you arrive at the meeting later than September 15, after the Special Agent has left, you cannot have your Certificate validated and consequently you will not obtain the benefit of the reduction on the home journey.

6. Certificates issued to children at half fares will be counted the same as Certificates held by adults.

7. If your Certificate is duly validated, you will be entitled up to and including September 20 to a return ticket via the same route over which you made the going journey *at one-half of the regular one-way tariff fare* from the place of meeting to the point at which your Certificate was issued. *(The identical route must be used in both going and returning in order to benefit under the Certificate plan.)*

8. Return tickets issued at the reduced fares will not be good on any limited train on which such reduced fare transportation is not honored.

9. *No refund of fare will be made on account of failure to obtain proper Certificate when purchasing going tickets, nor on account of failure to present validated Certificate when purchasing return ticket.*

A program of exceptional merit has been arranged, and we extend to you a cordial invitation to be present.

Transportation Committee

O. J. SPECKER,
R. L. SPRAU,
HARRY W. NELSON,
E. J. JUSTIS,
H. B. PINNEY, *Chairman,*
212 East Superior Street, Chicago, Ill.

TRUNK LINE ASSOCIATION

Sale dates for New York State (east of and including Buffalo, Niagara Falls, Suspension Bridge and Salamanca), New Jersey, Pennsylvania (east of and including Erie, Oil City and Pittsburgh), Delaware, Maryland, District of Columbia, Virginia and West Virginia (east of and including Wheeling, Parkersburg, Kenova, Orange and Norfolk).....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

TRANS-CONTINENTAL PASSENGER ASSOCIATION
WESTERN PASSENGER ASSOCIATION

Sale dates for Colorado (Julesburg only), Illinois, Iowa, Kansas, Manitoba (see note), Minnesota, Missouri, Nebraska, Northern Michigan, North Dakota, South Dakota, Wisconsin.....Sept. 7-13, Incl.
Colorado (except Julesburg), New Mexico, Wyoming.....Sept. 6-12, Incl.
Arizona, British Columbia, Idaho, Montana, Nevada, Utah, Oregon (except via California), Washington.....Sept. 5-11, Incl.
California.....Sept. 4-10, Incl.
Oregon (via California).....Sept. 3- 9, Incl.

NOTE—Manitoba (on Great Nor., Nor. Pac. and M., St. P. & S. S. M. Rys., also from Winnipeg via Can. Nat'l and Can. Pac. Rys.)
Final honoring date.....Sept. 20, 1932

SOUTHEASTERN PASSENGER ASSOCIATION

Sale dates for points in territory (south of the Ohio and Potomac and east of the Mississippi Rivers).....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

NEW ENGLAND PASSENGER ASSOCIATION

Sale dates for points in territory (New England).....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

SOUTHWESTERN PASSENGER ASSOCIATION

Sale dates for Oklahoma, Texas.....Sept. 6-12, Incl.
Arkansas, Kansas, Louisiana, Missouri, also Memphis, Tenn., and Natchez, Miss.....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

CENTRAL PASSENGER ASSOCIATION

Sale dates for points in territory (west of Buffalo, Niagara Falls, Salamanca, Pittsburgh, Wheeling, Parkersburg, and Kenova to and including Chicago and St. Louis, and north of the Ohio River, including Cincinnati, Louisville and Cairo).....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

CANADIAN PASSENGER ASSOCIATION

Sale dates for points in Canada, East of and including Armstrong, Fort William and Sault Ste. Marie, Ont.....Sept. 7-13, Incl.
Final honoring date.....Sept. 20, 1932

VALIDATING DATES SEPT. 13-15

AMERICAN DENTAL ASSOCIATION

Buffalo, N. Y. Sept. 12-16, 1932.

HOTEL RESERVATIONS

In securing hotel reservations for the 1932 Session, consult the hotel rate-sheet and fill out the blank application below. Mail immediately to the hotel you wish to patronize. The hotel will then advise you of the reservation which has been made for you.

As your first choice may not be available, kindly indicate a second and a third choice. If none of these are available, the hotel manager will mail your application to the Chairman of Halls and Hotels Committee, who will make a reservation for you again in as favorable a hotel as possible.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed on, please write or wire the hotel, releasing it, in order that your room may be available for other members.

MAIL THIS APPLICATION DIRECT TO THE HOTEL

HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, BUFFALO, N. Y., SEPT. 12-16, 1932.

.....Hotel. .....1932.

Buffalo, N. Y.

Please reserve sleeping room accommodations as noted below:

.....Room (s) with bath for.....people. Rate desired $..... (per day)

.....Room (s) without bath for.....people. Rate desired $..... (per day)

Second choice hotel.....

Third choice hotel.....

ROOMS TO BE OCCUPIED BY: ADDRESS IN FULL

Applicant..... .....

....

....

Please confirm this reservation to applicant. I further agree to notify the hotel at once in the event I am unable to use this reservation.

IMPORTANT TO HOTEL MANAGER: In the event you cannot accept this reservation, please forward this application at once to Dr. J. G. Roberts, Chairman Halls and Hotels Committee, 1839 Hotel Statler, Buffalo, N. Y., who will attend to the assignment of this reservation.

HOTEL	With Bath One Person	With Bath Two Persons	Without Bath One Person	Without Bath Two Persons
ARLINGTON				
136 Exchange		$5.00		$3.00
BUFFALO				
Washington and Swan	$3.00 S*	4.50 S		
	3.50 T&S	5.00 T&S		
	4.00 T&S	6.00 T&S		
	4.50 T&S	6.50 T&S		
		6.50 TB		
CHELTENHAM				
234 Franklin		3.00-5.00 TB	$1.50	
FAIRFAX				
Delaware near North		5.00-8.00		
		Suites 10.00-12.00		
FORD				
Delaware near Chippewa	2.00 S	3.50-4.00 TB		
		4.50 S, 3 persons		
		6.00 S, 4 persons		
		7.50 S, 5 persons		
GRAYSTONE				
24 Johnson Park		3.00-5.00		
		6.00 TB		
LAFAYETTE				
Washington and Clinton	3.50	5.00-6.00		
	4.00	7.00 TB		
LENNOX				
140 North	3.50	5.00-6.00 TB	2.00	3.50-4.00
MARKEEN				
Main and Utica	3.00	5.00		3.00
	5.00	6.00 TB		4.00 TB
STATLER				
Niagara Square	3.50	5.50		
	4.00	6.00		
	4.50	6.50		
	5.00	7.00 TB		
	6.00	8.00 TB		
	7.00	9.00 TB-10.00 TB		
STUYVESANT				
245 Elmwood	3.00	4.00		
		Suites 5.00		
		Suites 6.50		
TOURAINE				
Delaware and Johnson Park	3.00	5.00		
	3.50	6.00 TB		
WESTBROOK				
Delaware at North		Suites 6.00		
		Suites 8.50		
		Suites 9.00		
MEN'S HOTEL (Men only)				
308 Pearl			1.00	

*S, shower, T&S, tub and shower; TB, twin beds.

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1931-1932

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